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EDITORIAL.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Do Tsetse Flies Feed on Plant Juices?—Recently there appeared in the press an account by Dr. E. Warren, Director of the Natal Museum, of certain experiments and observations which had been carried out in Zululand on the feeding habits of the tsetse fly *Glossina pallidipes* and on the flagellate, the causal organism of the disease "nagana" or trypanosomiasis, transmitted by the fly to domestic animals. Dr. Warren states that in nature *G. pallidipes* feeds not only on mammalian blood, but also feeds normally on the juices of certain plants of the family *Euphorbiaceæ*. Flies when fed on latex alone have been kept in a state of good health for 38 days, proving that the fly is not dependent on blood and indicating that it is not possible to exterminate the fly by starvation by the eradication of game. It is further alleged that the trypanosome causing nagana has been discovered in the latex of plants used by the fly as a source of food, that these trypanosomes are transmitted to the fly during

feeding and that these flies eventually become infected with trypanosomes having all the morphological characteristics of the nagana trypanosome.

It is not possible to judge from the press reports whether there is any real foundation to the alleged discoveries, as no details are given of the experiments. The very fact that wild flies were apparently being used in the transmission experiments entirely invalidates them as scientific experiments, because under natural conditions approximately ten per cent. of the tsetse flies are infected with the "nagana" trypanosomes. There are a number of authenticated records of flagellate organisms occurring in the latex of plants, including a few South African records, but so far no true trypanosome has been recorded from plants. These leptomonad-like organisms are probably transferred from plant to plant by certain plant-sucking bugs. One doubtful record exists of such an organism being transmitted by a bug to a mammalian host. There are also records, one from Nigeria and one from Southern Rhodesia, of the tsetse fly *G. morsitans* being infected with a leptomonad flagellate in the proboscis and gut. This flagellate differs considerably from the non-trypanosome (crithidia) forms of the nagana organism which occur in the tsetse fly during cyclical development. The source of these infections is not known.

As long ago as 1913 Dr. G. D. Hale Carpenter, when working with another species of tsetse fly (*G. palpalis*), recorded the presence of starch grains in the gut of dissected flies and produced strong evidence that it feeds on plant substances. *G. morsitans* in Southern Rhodesia has been observed on many occasions to probe with its proboscis at inanimate objects, such as the hessian covering of a trap, a wooden box, the boots or leggings worn by an observer, etc. In fact, a hungry fly, when attracted to a hessian screen or the wooden walls of a trap, will alight with its head down and nearly always commence probing immediately. In this way this well-known habit might account for the fact that starch grains and other foreign bodies are occasionally ingested by tsetse flies.

In Southern Rhodesia during the last few years nearly 3,000 wild flies have been dissected and microscopically examined. None of the unmistakable, large, dumb-bell

shaped starch grains, stated by Dr. Warren to have been found in the gut of the flies used in the Zululand experiments, have been seen in gut smears made in this Colony. Admittedly in the areas where the Rhodesian dissections were made latex-bearing Euphorbiaceous plants are not common, but they do exist, and it is improbable that such striking bodies would have been overlooked if present.

Apart from the question of the source of infection of the tsetse fly, according to the Zululand experiments, flies were kept alive in good health for 38 days when fed on latex alone. It has been known for some years that tsetse flies could live under certain favourable conditions of humidity and temperature for at least ten days without feeding, but under laboratory conditions a feed is usually given every three to four days. Experiments recently conducted in Tanganyika suggest that under natural conditions the fly feeds about once every five days on blood. There is already some microscopic evidence that flies will imbibe water, and therefore, if blood cannot be obtained, it is possible that the fly can exist for quite a long period without a feed of blood. Experience in Southern Rhodesia, however, definitely shows that a considerable reduction in the tsetse fly density invariably follows immediately on game reduction.

At least eighteen species of African mammals are known to be hosts of the pathogenic trypanosomes. The cyclical development of these trypanosomes in the tsetse fly, followed by another form of multiplication in the blood of the mammalian hosts, is a definitely established fact. If plants also act as intermediate hosts for the trypanosomes the problem becomes more involved than ever.

The publication of the details of the Zululand experiments in the scientific press is awaited with great interest, and it will be interesting to see if all the assertions accepted by Dr. Warren are confirmed.

Tsetse Fly Operations.—A recent development in the campaign against tsetse fly is indicated by the appointment of Mr. W. R. Benzies, with effect from the 1st April, as

officer in charge of all arrangements for the destruction of game.

It is thought possible that, in view of the very scattered nature of these operations and of the diverse conditions under which they are at present being carried on, greater economy may be obtained by placing the control of the whole "front," in as far as the destruction of game is concerned, into the hands of one experienced individual, accustomed to the control of natives and familiar with the ways of the country.

Mr. W. R. Benzies, a senior Native Commissioner of wide experience, is eminently suitable for work of this description, but it is not to be anticipated that his services can be spared from his own Department for any longer period than that necessary to get the work thoroughly organised. Mr. Benzies has already commenced duty and his reports will be of great interest.

A further development is the re-organisation of the cattle camp on the outskirts of the fly area near Gatooma. This camp has been placed directly under the charge of the Veterinary Research Department, as the primary object to be attained is the methodical treatment by injections of cattle exposed to trypanosomiasis, with a view to determining the best conditions under which they can be maintained in a healthy and workable condition. It is known that these injections have in many cases been very successful; in other cases they have been less successful, and in some cases they have been apparently unsuccessful; and the desire of the Department is now to ascertain to what extent under proper precautions animals can be kept in good condition whilst exposed to the attacks of tsetse fly in various parts of the country.

The experience obtained in Gatooma will be tested out under suitable conditions in other areas, such as Mount Darwin and Melsetter, where losses of cattle have been reported.

Hull-less Oats.—In the issue of this Journal for March, 1931, attention is called to the series of hull-less oat selections which were being tested on the Salisbury Experiment Station.

From a chemical analysis which was given it was evident that the protein content of this type of oat was considerably higher than the usual type of hulled oats, being about 18 per cent. in the former and 15 per cent. in the latter.

A sample of hull-less oats was sent to the Imperial Institute by the Chief, Division of Plant Industry, for favour of report. This was submitted to the London Corn Trade Association, who reported as follows:—

> "The sample of hull-less oats is decidedly inferior to the samples of Scottish and Canadian shell-less (or shelled) oats at present being traded in.
>
> "There is a special trade for this type of grain from January to June arrival each year, and during the past year prices have varied between 9s. and 14s. per cwt. landed. On the sample received, we should say that at 1s. 6d. per cwt. less these Rhodesian hull-less oats would take the trade—that is to say, had they been on offer from January to June arrival this year, there would have been possibilities of business in small parcels at from 7s. 6d. to 12s. 6d. per cwt. landed. When this special trade is finished, the values drop considerably, and they have to compete with ordinary grinding oats suitable for the small country grinders, and the value at the present time of the year would certainly not be over about 6s. to 7s. per cwt. landed.
>
> "The trade in this article is decidedly a special one, and various country grinders will quote anything up to 5s. per quarter difference in value, according to their plant and their trade; but from January to June arrival each year there should be a possibility of finding a market for a series of small parcels at a fair price."

It would appear probable that this report was based entirely on the external appearance of the grain, and that no consideration was given to the protein content or general feeding value. Had this been taken into account, it is anticipated that the report might have been more favourable.

Several of the newer varieties undergoing trial on the Salisbury Station promise to yield larger and plumper grain which would probably secure a better price on the London market. At 7s. 6d. per cwt. landed in London the crop would

not prove profitable, but at 12s. 6d. to 15s. per cwt. hull-less oats would prove a comparatively profitable crop to produce.

Until further samples have been submitted and a further report obtained, the attention of poultry keepers in particular is drawn to the high feeding value of hull-less oats compared with maize or munga, as the protein content of the former is from 50 to 90 per cent. greater than in the other two grains.

New Light on Virus Diseases.—Special attention is being paid to the study of virus diseases by the scientific research workers at the National Institute for Medical Research at Hampstead, and also at the Lister Institute, London.

The nature of the viruses concerned in human diseases (such as small-pox and influenza), domestic animals (such as foot and mouth disease), poultry (by fowl-pox) and plants (such as the virus diseases of tobacco, sugar, potato, etc.) remained almost a complete mystery until a few years ago. They were known to pass through the finest porcelain filters and to be invisible under the highest powers of the microscope, and could not until recently be artificially grown. Recently a special ultra-violet ray microscope has been designed by one of the scientists at the Hampstead Institute, and it has been found that by this means viruses which could *not be clearly seen or photographed in ordinary light can now* be photographed. A means has also been discovered of propagating different viruses in the laboratory on living cells taken from animals and kept alive in cultures.

Special attention is being given to the virus of foot and mouth disease. Three distinct types of this disease are recognised in England, and the method of immunisation is complicated by the fact than an animal which is immune to one type is still susceptible to the other two. It is possible that the strain of the disease in this country represents another distinct type, and it would be of interest to get the opinion of the scientific workers at the two research laboratories on the particular type of foot and mouth disease found in this country.

The investigations into the virus diseases of plants are being concentrated at Rothamsted Experiment Station. At

this institution Dr. Henderson-Smith is paying particular attention to the relationship between the viruses concerned in plant diseases and the insects by which they are transmitted. It is considered possible that in some cases the virus concerned in plant disease may require the insect host for some phase of its development. If this should be found to be the case, it would accentuate the similarity between certain diseases of animals transmitted by insects and the virus diseases of plants.

Maize in Kenya.—A very interesting account of the maize position in Kenya by Mr. Colin Maher is published in the March number of *Tropical Agriculture.*

The total European production during 1929-30 amounted to 1,858,586 bags, and it has been estimated that the total native production for the same year was 1,387,104 bags. Prior to 1910 maize was not exported from Kenya, but in 1912-13 about 115,000 bags were disposed of in Great Britain.

The highest export so far recorded occurred in the 1926-27 season, when 1,100,000 bags were exported. The Kenya Flat White maize, which is almost entirely grown for export, is a hybrid derived chiefly from Natal White Horse Tooth and Hickory King.

The greater part of the maize crop of Kenya is grown in the Highlands ranging from 5,500 to 6,500 feet.

As the Equator passes through Kenya Colony, the length of day varies very little from about 12 hours during the year, and this fact in conjunction with the altitude means that Kenya maize requires eight to nine months to mature.

The average acreage put under maize by individual farmers is large, varying from 200 to 3,000 acres. Under the present system of one-crop farming, an economic unit appears to be 800 acres. The cost of maize growing in Kenya varies considerably from farm to farm.

A recent investigation by the Department of Agriculture indicates that the cost per acre varies from 35s. to 67s. 6d., including bags and transport, and the conclusion is reached that for successful maize farming yields of at least 13 bags

per acre are essential if any profit is to be made when the European price remains at about 25s. per quarter.

The average annual yield per acre during the last 10 years has been about 6.5 bags, and it is stated that the general employment of intensive and improved farming methods in Kenya, involving the keeping of stock and the practice of green manuring, must be extended before maize growing under normal conditions can be looked upon as a profitable line of farming.

Cleaning Seeds.—A new method of cleaning seeds which may prove to be of commercial importance has been discovered by research workers at the University of Toronto. By recognising and making use of a physical characteristic of seeds which apparently was overlooked previously, it has been found possible practically to eliminate weed seeds in lucerne, sweet clover, red clover and alsike. The apparatus required is extremely simple, being little more than a rotating band and a tub of water. The investigators observed a slight difference in the facility with which seeds can be wetted with water. It was found that after the fodder seed was wetted to a slight extent its "wetability" had attained the maximum, whereas the weed seed continued to be wetted. By the addition of certain re-agents which will accentuate the difference of "wetability," it is stated that separation of weed seeds from the fodder seeds will be commercially possible.

REPORT OF THE DIVISION OF PLANT INDUSTRY

FOR THE YEAR 1931.

By H. G. MUNDY, Dip.Agric., F.L.S.

Correspondence and personal interviews have decreased to a marked extent during the year, partly due to the virtual cessation of the flow of new settlers into the Colony, and partly to the fact that the majority of newer comers still carrying on actively have now acquired a considerable measure of farming experience.

The curtailment of activities resulting from economy measures has affected the Division severely. Apart from reductions in staff, the following operations have been totally discontinued:—

(a) Cost accounting on the Government Farm, Gwebi.

(b) Maize experiments conducted at the same centre on behalf of the Rhodesia Agricultural Union, and mole draining trials on arable land.

(c) A wide series of investigations covering various aspects of crop production on the sand veld with all the principal crops of the Colony, other than tobacco, commenced in 1929 on the Research Farm, Marandellas.

(d) An enquiry into the economics of sand veld farming on the commercial section of the same farm.

The closure of these various activities is the more to be regretted, in that they have been continued for so short a period as to yield no informative results.

This is particularly true of the cost accounting at the Gwebi Farm, which has entailed a considerable expense and

a great deal of painstaking labour on the part of a number of officials, practically to no purpose. The usefulness of the farm has been seriously affected by the constant changes in policy from which it has suffered during the past twelve years.

Travelling.—The virtual discontinuance of district tours and farm-to-farm visits, due again to financial stringency, has temporarily broken down the long and intimate association which the officers of the Division have maintained with the more closely settled farming areas. Lack of an agricultural extension service renders this personal contact between headquarter officers and the farmer of the utmost importance, and it is hoped that circumstances will not cause the interruption to be long continued.

Re-organised Research Work.—The research programme of the Division has been reviewed during the year, and in certain directions has been placed on a more satisfactory footing. The training of apprentices on the Tobacco Experiment Station, Salisbury, was discontinued, the pupils and the late manager (Mr. C. A. Kelsey Harvey) being transferred to the Matopo School of Agriculture, while the tobacco research work conducted for one season at Marandellas has now been made the primary function of the Salisbury Tobacco Research Station, towards the cost of which the Empire Marketing Board has generously donated a grant of £1,500 a year for two years. The investigations in progress formed the subject of discussion between the Chief Tobacco Expert while in England in the early part of the year and the technical advisers of the Board, and are of a nature calculated to assist very materially the tobacco industry of the Colony, and it is believed of neighbouring territories also.

The Botanical Branch has commenced a programme of investigations involving enquiry into the following economic problems:—

(a) The stock-carrying capacity on normal red maize land of some nine of the most promising native grasses.

(b) The possibility of securing by selection and crossing improved vegetative and seed yielding types of *Digitaria* spp., *Urochloa* spp. and *Brachiaria* spp.

(c) A more intimate study than has yet been possible of upwards of forty other of the more promising native grasses.

The practical importance of this work is exemplified by the fact that grazing experiments already carried out at the Agricultural Experiment Station, Salisbury, on two-third acre paddocks of woolly finger grass and Hunyani grass (*Chloris gayana*), situated on red doleritic soil, indicate that under normal rainfall conditions two acres of the former will carry three mature beasts from the 15th December to the 15th April, and that half an acre of the latter will provide sufficient pasturage for one similar beast from the 1st January to the 15th April.

Apart from his normal duties in connection with the recurrent plant diseases of the Colony and new diseases which periodically make their appearance, the Plant Pathologist is co-operating with the Agriculturists in an endeavour to test out more thoroughly the possibilities of the artificial inoculation of legumes which normally fail to produce root nodules, and whose growth—probably for this reason—under local conditions leaves much to be desired. Special attention is being given to the influence of this treatment on soya beans in the hope that in conjunction with the plant breeding in progress it may be possible to establish soya beans as a major legume crop for the Colony.

Witch Weed.—Enquiries into economical methods of controlling the maize parasite witch weed (*Striga lutea*) have been continued, and an informative progress report on the subject was recently published in the Journal by Capt. S. D. Timson, M.C. Apart from successful trap-cropping with such crops as maize, Sudan grass and kaffir corn, a great deal of valuable information of a negative character has also been acquired, while spraying experiments, particularly with sodium chlorate, have yielded encouraging results. The latter method of control will be further examined during the coming year.

The destruction of certain perennial weeds, notably bachelor's button (*Gomphrena globosa*), by means of chemical sprays has also been investigated, but here results have been less successful.

Herbage Plant Experiments.—The preliminary investigations undertaken on the Research Farm, Marandellas, with the object of ascertaining the best combinations of herbage plants for establishment on the wet vlei soils of Mashonaland have yielded extremely hopeful results. The plots have been established for only one year, but over this period white Dutch clover, Alsike, broad-leaved red clover of several types, cowgrass clover, cocksfoot, Yorkshire fog and several native grasses, including swamp couch (*Hæmarthria fasiculata*) and wild paspalum (*Paspalum scrobiculatum*), have shown themselves particularly at home on this class of land.

Owing to the moist character of the soil, all these species produced luxuriant growth during the winter, and a noticeable feature was the increased vigour and more verdant colour of the grasses where established in combination with white clover. A further hopeful sign for the permanence of the clover stands is the freedom with which these seed, and especially in the case of white clover, the strong resultant growth of volunteer plants.

These experiments appear to offer such promise that during the coming year the range of the work will be extended so as to embrace a very wide range of grasses and legumes in pure and mixed associations, on which the effect of lime alone and lime in conjunction with phosphatic fertilisers is likewise being studied.

Grassland Experiments.—In co-operation with the South African Explosives & Industries, Ltd., a number of experimental and demonstration plots of natural grass veld on private farms have been treated with artificial fertiliser. A Government grant is made towards the expenses of the scheme, and the work is organised by Mr. R. Lindsay Robb, Grassland Specialist to the Imperial Chemical Industries, Ltd., and his assistant, the Marquis of Graham, in consultation with the Chief, Division of Plant Industry. The fencing of the plots is provided by the farmer, who, in return for a free issue of the fertiliser, undertakes to keep the necessary records of the number of grazing days yielded under each system of treatment.

The first applications of fertiliser were not made until February, 1930, but treatment is now in progress on about

eighteen different farms, representing a wide variety of soils and grassland types.

It is as yet too early to express an opinion on the economic aspects of the fertilisation of natural grass veld, or on the ultimate effect on the herbage which this treatment, combined with the close rotational grazing which is being practised, will exert. It is already apparent, however, that cattle evince a preference for fertilised pastures, and that the grasses respond in a marked manner to applications of nitrogen and to complete artificials.

Grass Silage.—As a corollary to the application of fertilisers to natural grassland, and consequent upon the necessity of conserving all surplus growth thus produced in as nutritious and palatable a form as possible, initial experiments were undertaken at Gwebi and the Agricultural Experiment Station, Salisbury, in the making of grass silage. The results were highly successful, and it is evident that the ordinary veld ensiled at the correct stage of growth will yield a succulent fodder closely approaching maize silage in feeding value, and that certain of the natural grasses which can quite readily be established as "cultivated" grassland produce a silage as high in protein content as combined maize and bean silage.

The making of veld grass silage is being undertaken this season on all the Government farms and experiment stations except the Tobacco Research Station, and a number of farmers are also keenly interested in the subject. Thus quite a considerable amount of this kind of silage should be made in the Colony in 1932.

Plant Breeding.—The Plant Breeder has been transferred from the Marandellas Research Farm to the Tobacco Research Station, Salisbury, where he will devote most of his time to the problem of producing strains of tobacco of improved quality, yield and disease resistance. It is hoped, however, that opportunity will still offer to pursue his plant breeding with wheats, on which the preliminary work during the past two years is distinctly encouraging, and to give some attention also to maize.

On the Salisbury Experiment Station work as far as plant breeding is concerned has been concentrated mainly on

the oat and soya bean crops, and in both cases further segregations promise to yield strains distinctly superior to those which have yet been liberated.

Tobacco Industry.—The following extracts from the report of the Chief Tobacco Expert, Mr. D. D. Brown, afford

A stack of vlei-grass silage. Wire netting and sand bags round edge and earth cap. Stack originally up to top of ladder.

additional information regarding the functioning of the Tobacco Branch:—

"The customary duties falling within the functions of the branch have been duly performed, though on a restricted scale owing to financial stringency. During the major portion of the year the staff has not been at full strength. The Chief Tobacco Expert was absent on duty overseas during the first quarter of the year, and the services of a tobacco adviser in Matabeleland were dispensed with on the 31st March, 1931. The Tobacco Adviser, Salisbury, was absent for several months on serious indisposition leave. The Assistant Tobacco Research Officer was granted leave pending retrenchment, which took effect from the 30th November,

1931, and the Foreman, Tobacco Research Station, resigned on the 31st October, 1931.

"The Tobacco Adviser, Salisbury, assumed duty as Officer-in-Charge of the Tobacco Research Station on the 1st September. The Plant Breeder and an assistant were transferred to this station from other posts and assumed duty during the month of October.

"*Seasonal Conditions.*—Speaking generally, the climatic conditions of the past season were not entirely favourable, and in consequence the quality of the tobacco crop was adversely affected, there being a high percentage of low-grade leaf.

"The acreage planted to Hickory Pryor showed a considerable decrease. This is in accordance with the policy, initiated by the Tobacco Branch in 1928, of planting only those varieties considered to be more suitable for market requirements than the local Hickory Pryor strain. The most popular variety of flue-cured tobacco has now proved to be White Stem Orinoco, which produces a type of leaf suitable for oversea requirements.

"Cut worm and wire worm were active this season and did considerable damage, necessitating a great deal of re-planting.

"It is satisfactory to record the increasing attention being given to precautionary measures against mosaic disease. The general adoption of suitable measures should tend to reduce the incidence of this disease, which has increased tremendously during the last decade.

"*Production.*—The production of tobacco over the period 1925 to 1931 has been as follows:—

	Virginia Type.			Turkish Type.		
Season.	Acres planted.	Yield in lbs.	Acre yield in lbs.	Acres planted.	Yield in lbs.	Acre yield in lbs.
1925-26 ...	13,160	5,313,186	404	755	346,623	459
1926-27 ...	29,172	18,631,069	638	992	633,488	638
1927-28 ...	45,711	24,491,464	536	911	451,580	496
1928-29 ...	16,761	6,704,986	400	979	337,478	344
1929-30 ...	9,681	5,494,063	567	787	350,140	444
1930-31* ...	15,297	8,113,000	530	884	409,000	462

* The returns relative to the 1930-31 season are estimates only, final figures not yet being available.

"*Marketing.*—A special visit to the United Kingdom made by the Chief Tobacco Expert under the ægis of the Empire Marketing Board elucidated many important points connected with the problem of marketing Southern Rhodesia tobacco in Great Britain, and considerable improvement in this respect may be recorded as compared with the position in 1930.

"*Research.*—In view of the closing down of the Salisbury Tobacco Experiment Station and the urgent need for economy, the latter station has been handed over to the Tobacco Branch, and is now established as the Tobacco Research Station in place of a similar institution opened at Marandellas during the year 1930. Financial assistance has been granted by the Empire Marketing Board in order to expedite the investigation of the more pressing problems facing the tobacco industry.

"The programme of work proposed for the season 1931-32 includes variety trials, fertiliser experiments, rotation trials and plant breeding, in addition to a series of investigations concerning cultural operations. The main objective of the work as arranged at present is improvement in the quality of the crop.

"Many important investigations have of necessity been postponed until such time as more adequate funds become available.

"In response to requests by farmers' associations a series of variety trials is being conducted under the supervision of the branch on several farms in each of the following districts: Mazoe, Lomagundi, Hartley, Salisbury, Marandellas and Makoni.

"*Publications.*—The following articles were prepared for publication in the *Rhodesia Agricultural Journal*: 'Tobacco Curing—Leaf Method *versus* Stalk Method,' by W. V. C. Evans, B.Sc. (Agr.), Tobacco Adviser; 'Selection of Tobacco Seed Plants,' by H. F. Ellis, M.Sc., B.Sc. (Agr.), Tobacco Adviser; 'Grading and Handling of Fire-cured Tobacco,' by H. F. Ellis, M.Sc., B.Sc. (Agr.), Tobacco Adviser; 'Some of the Problems in Marketing Southern Rhodesia Tobacco,' by D. D. Brown, Chief Tobacco Expert; 'Tobacco Seed Beds,' by D. D. Brown, Chief Tobacco Expert; 'Transplanting of Tobacco,' by D. D.

Brown, Chief Tobacco Expert; 'Seasonal Notes on Tobacco Culture,' by D. D. Brown, Chief Tobacco Expert.

"In addition to the above articles prepared for the *Agricultural Journal*, the Chief Tobacco Expert made several contributions on tobacco matters to the local newspapers, and also prepared special reports describing the historical, economic and technical development of the tobacco industry in Southern Rhodesia for publication by the High Commissioner and by the British Empire Producers' Organisation."

Citrus Industry.—There has been no extension of citrus fruit planting this year, and a decrease is recorded in the export of fruit compared with previous years. The total amount railed for export is stated to be 168,455 cases, of which 53,167 cases were exported via Beira. The previous season's figures were 153,664 cases shipped via Union ports and 29,174 cases by Beira.

The decrease is attributed to frost injury in some groves, low overseas prices and poor crops of Washington navels.

The probable commencement of an export in orange oil, referred to in my last report, has been realised. Oil has been shipped to Great Britain, Germany and the United States of America, has been very favourably reported upon and has sold at prices equal to that realised by the best Sicilian oil. It is understood that the plant is being enlarged for the coming season, and that in addition to an increased output of oil, concentrated citrus juice for export overseas will be included in the products of the factory.

A Salisbury factory has also produced large quantities of bottled citrus juice, which promises gradually to displace the imported article.

The following information is given by the Horticulturist, Mr. G. W. Marshall:—

"*New Markets.*—14,964 cases were shipped to new markets compared with 10,937 cases the previous season. New markets exploited were: Canada, 9,627 cases; France, 1,460 cases; Germany, 2,025 cases; Sudan, 400 cases; Italy, 900 cases; India, 412 cases; Port Said, 90 cases; Greece, 50 cases.

"The average price realised for this year's fruit is not yet available, but from enquiries made it is anticipated that it will be lower than that of previous years. This lower trend in values is apparently due to the abnormal supply of citrus fruits now offered on the world's markets. Great Britain (our chief customer) normally consumes during the summer months about three million cases of citrus fruit, but this year supplies offered have exceeded that amount by one and a half million cases.

"*Deciduous Fruits.*—Little progress is being made in the establishment of deciduous fruit orchards, due to the shortage of funds for purchasing trees. Improvement is noticed, however, in the grading and marketing of fruit.

"Several of the new varieties and selections at present under trial promise to surpass the older varieties, both in respect to quality and yield.

"*Coffee and Tea.*—Most, if not all, of the coffee plantations reported upon by Mr. N. D. Trench in 1929 were visited in June and July, and it is gratifying to record that the plantings have made excellent growth and are now yielding good crops of high class coffee.

"The future of the industry, though limited in extent, may be regarded as fairly assured, and it should expand when the electrically equipped coffee manufacturing plant is completed at New Year's Gift Estate, where most of the Rhodesian coffee will probably be prepared in a manufactured form.

"Favourable reports continue to be received of the tea garden on New Year's Gift Estate, South Melsetter, and Rhodesian tea is gaining in local popularity. Even more encouraging results are being obtained at Ratels Hoek on the Eastern Border, where an experimental planting of a few acres of tea (not under irrigation) promises extremely well.

"*Marketing Farm Side-lines.*—During the first quarter of the year a considerable amount of time was devoted to promoting and assisting in the organisation of a co-operative marketing scheme for fruit, flowers and other farm side lines. It is pleasing to report that the endeavours were instrumental in the formation of the Producers' Direct Supply Co-operative Company, Limited, which opened it

first store in Salisbury in February with a membership of one hundred; a second store was opened at Bulawayo in October. The membership has increased to three hundred, and the organisation appears to be well launched on a successful career."

Plant Pathology.—Matters of special interest referred to in the annual report of Mr. J. C. Hopkins, Plant Pathologist, are as follows:—

"Three hundred and forty-three lots of infected material were received for diagnosis. This was eleven more than in the previous year and embraced sixty-six specimens, constituting new records of plant diseases in the Colony, of which a number were on indigenous plants. Two hundred and fifty named specimens were added to the herbarium.

"*Investigations.*—Trials for the control of white mould in tobacco by applications of snlphur were laid down on the Research Farm, Marandellas, but no results were obtained owing to the non-development of the disease.

"Preliminary experiments were carried out on the Tobacco Research Station for the control of red rust. It was found, as suspected, that the disease is correlated with height of topping. Further experiments on an extended scale are in progress this season.

"Attempts to determine the cause of 'crinkling' were abortive. No positive results were obtained in attempted transmission of the disease from one plant to another. It is suspected that a virus may be concerned. Similar experiments are in progress this season in connection with the leaf curl disease, but virus work, involving the use of insects, is much hampered by lack of staff and apparatus. Some success has been obtained in differentiating between the different viruses affecting both wild and cultivated plants of the Solanaceæ. A suspected new virus disease on tomato is at present receiving attention.

"The leaf spot of tobacco caused by *Alternaria tabacina* has appeared in epidemic form in several districts during the year, and investigations are being continued into the etiology of the disease with particular reference to solanaceous weeds. A similar *Alternaria* has been found attacking *Datura stramonium*. An infection experiment on tobacco has yielded negative results.

"*Miscellaneous Diseases.*—The constant demands by tobacco growers upon my services have made it impossible for much attention to be given to other economic crops. It has been possible, however, to lay down some small plots to tests various seed treatments for the control of angular spot of cotton, but no further work upon the pathology of diplodia in maize could be undertaken. Trials of alleged diplodia-resistant varieties received from the United States of America have been arranged in conjunction with the Plant Breeder.

"Urgent demands have been received from farmers for investigations to be made into brown fleck disease of potatoes and blindness in barley and wheat, but under present circumstances there is little possibility of our being able to meet these requests.

"*Nodule Bacteria for Soya Beans.*—This branch has undertaken the culturing of various strains of nodule bacteria obtained from different sources, and a project has been drawn up for the testing of the different cultures under local environmental conditions. Trials are now in progress on the sand veld at the Tobacco Research Station and on the red soil at the Salisbury Experiment Station.

"*Publications.*—The 'Handbook of Tobacco Diseases' was completed and published about the middle of the year, and 2,000 copies have been received for local sale.

"The agency for local distribution was given to the Rhodesian Printing and Publishing Company, who are selling the book for 4s., of which 3s. is remitted to the Government. About 160 copies have been disposed of.

A paper on *Alternaria* disease of cotton was published in the December issue of the 'Transactions of the British Society.' The following articles have appeared in the *Agricultural Journal*: 'Plant Pathology in Southern Rhodesia during 1930' (April); 'Mycological Notes—Diplodia' (July); 'Some Common Diseases of Potatoes in Southern Rhodesia' (August); 'Mycological Notes—Care of Tobacco Seed Beds' (October).

"*Movements.*—Extension work has had to be considerably curtailed, and only fifteen farms have been visited during the year, and fifteen visits were paid to the Government Experiment Stations for the purpose of supervising experiments.

"*Agricultural Shows.*—A large exhibit was placed on the Salisbury Show, illustrating methods to be adopted for the control of tobacco and maize diseases. Various types of wet and dry spraying apparatus were shown, which elicited numerous enquiries. It is unfortunate that more time cannot be given to propaganda in connection with the use of modern fungicides."

Botanical Branch.—The following forms part of the annual report of the Senior Botanist, Miss Sydney M. Stent:

"During the year 5,553 specimens of plants have been mounted; of these 3,791 were incorporated in the herbarium; the remainder were duplicates mounted for the Forestry herbarium and for individual collectors. The duplicate herbarium numbers about 1,200.

"With the growth of the herbarium, the work of identifying plants and recording their distribution, habit of growth, etc., has been very greatly facilitated.

"The duplicate herbarium has proved a great asset, the specimens being used not only as plant exchanges with herbaria in other parts of the world, but also in exchange for valuable literature which could not otherwise have been procured.

"In all, 567 specimens have been received from other herbaria, including 340 from the National Herbarium, Pretoria, 100 from Dr. Muir's Herbarium, Riversdale, and 27 from Kew.

"This herbarium has distributed 100 specimens to the National Herbarium, 32 to the Rijks Herbarium, Leyden, and 52 to Kew Herbarium.

"A special collection of common weed seeds and of native leguminous plants has been commenced.

"The whole herbarium has been indexed and the economic and literature indexes are well advanced, and a fairly comprehensive index to local names has been compiled.

"An exhibit of indigenous grasses classified according to their habitat and their economic value was prepared for the Salisbury Agricultural Show; also an exhibit of indigenous or naturalised poison plants. An article on the known

poisonous plants of Southern Rhodesia was prepared for the *Agricultural Journal*, and reprints were made available for distribution in connection with this exhibit.

"The exhibit of poisonous plants excited a good deal of interest among farmers, and reports were subsequently received from Shamva, Marandellas, Sinoia and Hartley of fatality amongst the stock, suspected to be due to plant poisoning. These localities were visited by the Botanist and collections were made of suspicious plants, feeding tests being carried out by the Veterinary Research Department; these resulted in the establishment of one species of plant—*Moreæ zambesiaca*—as being definitely poisonous to stock.

"*Pasture Grass Experiments.*—Small observation and demonstration plots in duplicate have been laid down on the Experiment Station, Salisbury, of the more promising indigenous grasses, one series of which is untreated and the other fertilised with rock phosphate.

"Breeding experiments have been commenced with four species of *Digitaria*, three species of *Urochloa* and two species of *Brachiaria* with a view to producing strains with better vegetative and seeding characters.

"Work in connection with pasture research entailed four visits to Marandellas and three to Matopos, undertaken by Mr. Rattray, Botanist, for the purpose of making botanical analyses and detailed observations of the pastures.

"The herbarium is greatly indebted to the following for valuable contributions to our botanical library: Professor Hitchcock, Senior Systematic Agrostologist to the United States Department of Agriculture; Mrs. A. Chase, Associate Agrostologist; Dr. Henrard, of the Rijks Herbarium, Leyden; Mlle. Aimee Camus, of the National History Museum, Paris; Dr. D. C. Steyn, of Onderstepoort, Pretoria, Transvaal; and the Chief, Division of Plant Industry, Pretoria."

Gwebi Farm.—The fall in commodity prices and the stoppage of export of slaughter cattle to the Union and overseas have adversely affected the revenue of this farm, and early in the year it became apparent that the institution could not long remain self-supporting, unless a material improvement in marketing conditions might be looked for. The output of the various crops raised was regarded by the

Economy Committee as competing unwarrantably with that of private farmers on markets already overloaded. As a result of this combination of circumstances, it was decided, as a first step, to lease off half of the farm, to discontinue cost accounting, which, it is estimated, entailed an extra expense of at least £500 a year over normal running costs, and to restrict crop production to farm requirements.

Approximately 1,600 acres, including about 700 acres of arable land, have been leased for three years at a minimum rental of £300 per annum, and steps have been taken to dispose of a considerable proportion of the grade Friesland herd. Sales of breeding stock have, however, been delayed owing to foot and mouth restrictions.

Climatic conditions in December and January were unfavourable, 20½ inches of rain out of a total of 30¼ inches falling in these two months. Heavy, low-lying land became water-logged, and crop growth was retarded in consequence. The maize yield, however, was 10.2 bags an acre over 507 acres, with a minimum return from any field of 6.5 bags and a maximum of 13.4 bags an acre. The average yield during the past six years has been 10.52 bags an acre.

The systems of rotation and soil management practised at Gwebi have been those advocated by the Division for general adoption by maize growers and "mixed" farmers, and the fact that the yield of the staple crop has been maintained so satisfactorily through several adverse seasons and on soils of very variable fertility, comprising none particularly rich, affords good evidence of the soundness of the methods.

Machine check-row planting of maize on a large scale has been proved satisfactory and economical, and the practice can now be unreservedly recommended.

Live Stock.—Cattle and pigs have continued to do well, though many of the cows in the pedigree Friesland herd are now old and their milk productive powers have dropped considerably. The average number of combined pedigree and grade cows in milk throughout the year was 33.3, and the average milk yield was 22½ lbs. per diem. Production was less than in the previous year, and in this connection the farm manager remarks: "No cows were pushed for milk records, for, taking butter fat at present prices, it is obvious

that feeding for records can only result in loss. On the other hand, records are necessary if pedigree dairy stock are to be bred for sale, and thus we find ourselves in a cleft-stick.''

The imported pedigree Shorthorns have done remarkably well and the herd has increased from the original ten imported heifers and two bulls to a total of twenty-four, there being now eight young bulls and bull calves and four heifer calves.

Foot and mouth disease restrictions have debarred the sale of breeding stock for the last nine months and in consequence there is an abnormally heavy carry-over of young bulls. For similar reasons only a few pedigree pigs could be sold.

Experiment and Demonstration Stations.—Operations on the Bulawayo Demonstration Station, in co-operation with the Municipality of Bulawayo, were discontinued at the close of last harvest, the crop experimental work for Matabeleland being now centred at the Matopo School of Agriculture. The Department is greatly indebted to the Municipal Council of Bulawayo for the readiness with which they met the writer's original request in 1921 for assistance in inaugurating this station, and for their continued support of the scheme over a period of ten years. The experiments have afforded reliable information on many important problems connected with arable farming in Matabeleland.

On the closing down in July of general crop experiments on the Tobacco Experiment Station, a report summarising the results to that date was prepared by Mr. C. Kelsey-Harvey—the then manager—and was published in the *Journal.*

Reports have likewise been published in the *Journal* on the results of all major investigations in progress on the Agricultural Experiment Station, Salisbury, and on the Gwelo Demonstration Station, and further comment here is unnecessary.

Good progress is being made on the Enkeldoorn Demonstration Station situated on Belvoir Spinney and the yields during the past two seasons on this poor granite sand have been highly satisfactory. Maize returns in the various rotations have ranged between 6¾ and 14 bags an acre, the

latter being obtained last season from maize receiving 200 lbs. of 19 per cent. superphosphate per acre, following sunn hemp ploughed under.

An interim report on the first four years' results will be published after next harvest.

Wet Maize.—It is gratifying to record that the campaign of the last few years against wet maize has at last borne fruit, and very little trouble from this cause was experienced, save in one area which had not previously participated in export overseas. Here, however, growers had evidently been in the habit of marketing their maize for local consumption in a very moist condition, and the bulk of the grain first forwarded to the local Co-operative Society was too wet to export. A special visit was paid to the area by the Senior Grain Inspector and the writer to enquire into the matter and explain to growers the causes to which wet grain is usually attributable.

The marked improvement in this respect throughout the rest of the maize belt is undoubtedly mainly due to the summarised reports which were published in the *Journal* and local Press on the improved harvesting methods adopted by growers who have consistently managed to overcome this difficulty.

Maize Grading.—There was not as large a falling-off in the amount of maize requiring to be graded as was expected. In all, 663,223 bags of maize, 20,084 bags of meal and 2,564 bags of sunflower seed were inspected and graded. Of the maize and meal, 36,383 bags were graded by checkers of the Maize Control Board and the remainder by Government graders.

The figures for the past three years are as follows:—

1929	908,139 bags of produce graded.
1930	870,238 bags of produce graded.
1931	685,871 bags of produce graded.

Demands for grading along the main railway line as distinct from the branch lines is increasing, and this year 85,500 bags of maize were graded between Gatooma and Inyazura. This maize mostly offers in small parcels at widely separated points and much travelling is entailed by its inspection.

Two grain inspectors were employed for 9½ months of the year, aided by three temporary graders—one for 2½ months and two for one month each.

Yellow Maize.—A case occurred where certain persons planted yellow varieties of maize in close proximity to large extents of white maize, in a locality not proclaimed under the Maize Act of 1925 as a white maize area. Serious injury would have resulted to the neighbouring growers of white varieties had those who planted yellow strains not agreed to the crops being uprooted and to a white variety being planted instead. The instance exemplifies the need for growers of white maize to safeguard their position by securing the declaration of their districts as white maize areas under the *Act.*

International Exhibition, Elizabethville.—In collaboration with Northern Rhodesia and the Rhodesia Railways, a Rhodesia Pavilion was erected at this Exhibition and a joint exhibit was staged. The arrangements were left to a committee representing the three administrations, the Chief, Division of Plant Industry, acting for Southern Rhodesia, and attending the Exhibition for the first week. Exhibits from this Colony were mainly confined to raw and manufactured agricultural products likely to find a market in the Congo. Local commercial firms lent ready support to the scheme and the material forwarded was of very high quality and thoroughly representative of the agricultural industry.

Acknowledgments.—In conclusion, it is desired to record with appreciation the loyal and efficient manner in which all members of the Division have carried out their duties. Our sincere thanks are offered to other sections of the Agricultural and Veterinary Departments, to the staffs of other Government Departments, and to all organised bodies and private individuals upon whose co-operation and good will such frequent calls are made.

MYCOLOGICAL NOTES.

DIPLODIA IN MAIZE.—THE BENEFITS OF SEED TREATMENT.

By J. C. F. Hopkins, B.Sc., A.I.C.T.A., Plant Pathologist.

At this time of the year, when crops are being harvested, the question of Diplodia and its control becomes once more a matter for discussion amongst the maize growers, for the destruction of crops caused by the parasite is at once obvious and alarming. The question is then asked: "Cannot something be done to prevent these losses?" And the answer is again heard, as from a voice crying in the wilderness: "Yes; clean up your maize lands as early as you can and burn off the superfluous trash." Ploughing in stubble does not eradicate Diplodia, and infection is carried to next year's crop, when a further destruction of cobs becomes inevitable.

Losses from Diplodia are not, however, confined to straightforward rotting of grain; in fact, it is the more obscure phases of the disease which are responsible for the largest reductions in yield. A "mouldy" cob obviously gives a high proportion of infected grain, and is rejected when selecting seed, but a cob which has a few brown kernels and is otherwise apparently sound is retained. Generally speaking, this policy is adopted by most growers, so that it is extremely difficult, if not impossible, to find in the Colony a commercial sample of seed which is not infected by Diplodia. Most samples which have been tested in the Plant Pathology Laboratory have yielded between 20 and 30 per cent. of diseased kernels; some up to 55 per cent. When such seeds are planted, a good number fail to grow owing to the germ having been killed by Diplodia.

Others which do germinate are forced to struggle for existence against the attack of the parasite, and frequently

succumb before they have developed a sufficient number of roots to maintain themselves. This "seedling blight," as it is called, is commonly responsible for reductions in stand of 15 or 20 per cent., and occasionally of as much as 40 per cent. under local conditions.

But the effects of Diplodia do not end here. A number of plants which manage to grow to maturity appear never to recover from the check received early in the season, either because their root development is impeded by fungus activity, or else because they become crowded out by their more vigorous neighbours. These plants usually produce small cobs or nubbins, and do not "pull their weight" in the crop. They are not a paying proposition, or, as the Americans say, they are unprofitable boarders.

How, then, is a crop to be freed from such plants? Obviously, by selection of healthy seed and by the use of a fungus poison capable of killing Diplodia; in other words, seed treatment by a suitable fungicidal dust such as Tillantin R, Semesan Junior, Merko, or other of the many commercial products upon the market. Consistently good results have been obtained locally with seed treatment; and even with seed selected kernel by kernel, an increase in yield of as much as 4 per cent. has been obtained by the use of a Tillantin R dressing.

Confirmation of the benefits to be derived from seed treatment with modern fungicidal dusts may be found in a recently published bulletin of the United States Department of Agriculture (1), which gives the results of eleven years' investigation into the value of maize seed disinfectants. The conclusions arrived at by the authors are as follows:—

At the beginning of the eleven-year period, liquid treatments were more effective than the dust disinfectants then available, but at the present time dust disinfectants have entirely replaced the liquid treatments. Suitable maize seed dust disinfectants are effective in controlling such infections of Diplodia as occur in well-selected lots of seed, and also aid in controlling other seed-borne diseases (*which are included under the name of Diplodia in Rhodesia.*— J. C. F. H.), and offer some protection against soil-borne diseases.

The use of seed treatments is usually followed by better stands and increased vigour in the young plants, which is occasionally reflected in a greater resistance to lodging. Ear rots were found to be slightly reduced by the use of seed treatments (*no such evidence has been obtained in Rhodesia.*—J. C. F. H.), and the yield of maize grown from average, well-selected farmer's seed was found to be increased by about a bag an acre. This would mean, under Rhodesian conditions, a return of between 6s. and 7s. per acre for the expenditure of about 2d. per acre.

The authors conclude the report of their eleven years' study with the following paragraph: "*It appears that seed treatment may be considered and used as an effective means of guarding against such losses as result from seed-borne infections and soil-borne diseases that adversely affect corn* (*i.e.*, maize) *plants during the young plant stage.*"

It is to be hoped that a spirit of false economy will not cause our maize growers to be imbued with the fallacy that the discontinuance of seed treatment is a way of cutting down overhead expenses; for an increase in yield of only one bag per acre represents an addition of 10 per cent. to the annual income, and can be obtained for the outlay of a few pence per acre.

REFERENCE.

(1) Holbert, J. R., and Koebler, B.—"Results of Seed Treatment Experiments with Yellow Dent Corn." *U.S. Dept. Agric., Tech. Bull.* 260, December, 1931.

NOTES ON THE PRODUCTION OF ESSENTIAL OILS,

WITH SPECIAL REFERENCE TO RHODESIA.

By Lieut.-Colonel Stewart Gore Browne, D.S.O., Shiwa Ngandu, Mpika, Northern Rhodesia.

The present writer has been asked so often about the possibilities of producing essential oils in Rhodesia that the following notes on the subject, which are the result of over ten years' experience with essential oils in this country, may not be without general interest. It is to be feared, however, that most of the information is of a negative character.

In the first place, it must be emphasised that it is quite useless to think of starting to manufacture essential oils without a considerable amount of capital, for the following reasons:—

(1) *The distilling plant is costly, and it is required* in addition to most of the agricultural gear used on an ordinary farm.

(2) A big acreage has to be kept under cultivation, and abundant labour is needed. The crops are bulky, though the yield of oil is small.

[The low yield affects the cost of production materially, and is one of the reasons for the comparatively high price of most essential oils. Thus a ton of orange blossom will only produce about 40 ounces of neroli oil. An acre of geranium, containing from 10,000 to 15,000 plants, which can be cut two or three times a year, will not yield more than about 20 lbs. of oil annually (worth at present prices about £16). Lemon grass, with an oil percentage of 0.2 to 0.4, should yield about 30 lbs. of oil per year (worth, perhaps, £4) per acre.]

(3) The market is a highly speculative one. Thus peppermint oil, which touched £6 per lb. in 1925, is to-day worth 7s. 6d. On the other hand, distilled lime oil, which was worth 2s. 3d. per lb. in 1923, is to-day quoted at 42s. 6d. per lb.

It follows, therefore, that to go in for essential oils as a side-show whilst hoping for better times in ordinary farming, or whilst waiting for other crops to mature, is not a practical proposition. Nor are essential oils money for nothing in any sense of the phrase, and they certainly do not meet the case of one correspondent who complained that his own branch of farming had become an all-the-year-round job, and he wanted something less exacting.

There are some fifty to sixty different kinds of essential oils which are normally quoted in the market, besides many others of purely theoretical interest. The market oils fall roughly into two classes—those which are of use to the soapmakers and those which are used for a variety of special purposes, such as medicine, perfumery, chemistry, etc. Oils in the former class are required by the ton, but their price is, comparatively speaking, low. Oils in the latter class are only used in small quantities and the demand is irregular, though the price is often high.

Of the oils in steady demand, some are from plants which will only grow in tropical countries and some only in temperate climates. Cloves are an instance of the former, and lavender and caraway of the latter. Others will not yield to simple distillation and need not be considered here.

The following, however, which are all oils in constant demand, can be distilled from plants or trees which do well in Rhodesia, and are worth considering as a commercial proposition in this country:—

Oil.	Price Range, 1921-31.	Oil Percentage.
Geranium	10/- to 40/6 lb.	0.2
Peppermint	7/3 to 120/6 lb.	0.15
Lemon Grass	1/8 to 4/8 lb.	0.2 to 0.4
Citronella	1/4 to 6/3 lb.	0.4
Oil of Limes (distilled)	2/3 to 45/- lb.	0.2
Neroli	15/- to 150/- oz.	0.1
Petitgrain	4/2 to 22/6 lb.	0.15 to 0.3
Eucalyptus	1/3 to 3/- lb.	1.0

The plants from which these oils are obtained have all been grown by the present writer at Shiwa Ngandu, in Northern Rhodesia, with the exception of citronella, which, however, corresponds closely in all respects with lemon grass, under the following local conditions:—

Altitude: 5,000 feet to 4,500 feet.

Annual Rainfall: 44.43 inches (normal).

Temperature Range: 85 degrees to 31 degrees (approx.).

Soil: Generally light, sandy.

Fertilisers Available: Kraal manure, wood ash, distillation residue.

The general conclusions arrived at so far are that there is no difficulty in raising these oil-bearing plants, and a good many others besides, on a small scale; nor is there any great difficulty about distillation, and the results obtained in practically every case have been, according to the laboratory analyses at home, oils above the average in quality. The percentage of oil obtained seems to be about the same as in other countries; in the case of eucalyptus oil it has been consistently above the normal. The chemical constituents of the oils are also normal. The real difficulty seems to lie in establishing these crops on a large enough scale to enable the costs of production to be kept low enough to make the manufacture of the oils a commercial proposition.

The following cultural notes may be of interest. Costs are not given, partly because so much of the work has been experimental, partly because the price of labour varies so in different parts of the country that they might only be misleading.

Geranium.—Distilled from the leaves and stems of *Pelargonium roseum* and *P. odoratissimum* and various hybrids. The plants grown here came originally from cuttings from Corsica, but the main centres of the industry are the South of France, Algiers and Réunion. Cuttings are the only means of propagation and are not difficult to strike, but there is apt to be considerable loss in planting out. I did not find planting cuttings in the open field *in situ* satisfactory, however. Cuttings should he twelve inches to fifteen inches long, and any time in the warm weather before the

rains seems a suitable time to strike them. A light, well drained soil is the best for growing geranium, and anything approaching a water-logged site is fatal. Plants should be set out about eighteen inches apart. Cultivation is very important and has to be done by hand. Here the whole area had to be hand cultivated at least three times during the wet season. Reaping also has to be done by hand with knives or secateurs. Three cuts a year are said to be obtained in Algeria, but I have never got more than two here. A plantation should last up to ten years, but here white ants and the excessive damp of the rainy season kill off the majority of the plants after the first year. The oil distilled here was exceptionally well reported on and sold readily in London, but the short life of the plants and the cost of production did not leave any margin of profit. It would seem, however, that this crop would be well worth investigating in localities with a lower rainfall, where too the menace of weeds and white ants might not be so great.

Lemon Grass.—This is a low priced oil distilled from the leaves of *Cymbopogon flexuosus* or *citratus*. The plants are propagated by division of roots, and it is a very easy crop to establish. It prefers light, well drained soil, and if the plants are set out at about twelve inches by eighteen inches at the beginning of the rains, one cutting can be obtained by the following March. When the crop is established, three cuttings a year are possible. It has to be replanted at intervals of about four years and is an exhausting crop. There is a large demand for lemon grass oil for soap-making, and the oil produced here sold readily and was described as "a good marketable oil of the West Indian type." But the price is low, and £4 to £5 per acre is the outside value of the crop. It follows, therefore, that the cost of production must be kept down, and unless the grass can be relied on to smother weeds and practically grow itself it will not be profitable.

Citronella Grass (*Cymbopogon nardus*) is the source of citronella oil, for which there is a big demand. It is similar to lemon grass in all respects, except that it does not require replanting every few years. The price of the oil is generally lower than that of lemon grass oil.

Palmarosa (*Cymbopogon martini*, var. *Motia*) and **Ginger Grass** (*Cymbopogon martini*, var. *Sofia*) both yield oils which are quoted at a higher price than either citronella or lemon grass oil, but the demand is small.

All these grasses are grown largely in Ceylon, the West Indies and India. A grass similar to lemon grass is indigenous in Northern Rhodesia in the Luangwa Valley.

Peppermint Oil.—This is an oil in considerable demand, and large quantities are produced annually in the U.S.A. and in Japan—in the former country from *Mentha piperita*, in the latter from *Mentha arvensis*. There was a boom in 1925, and for a short time the price rose as high as £6 per lb., but 7*s*. 6*d*. is about its normal value. The plants grow easily from suckers, but in this country I found that they died down after a year instead of lasting four or five years as they should. Rich peaty soil is the best, and the yield of oil from an acre should be twenty to thirty pounds.

Citrus Oils.—From the flowers of the bitter orange (*Citrus bigaradia*) neroli oil is distilled, and from its leaves petitgrain oil. The juice of limes (*Citrus medica*) when distilled yields oil of limes or limette, and the rind of limes, when hand-pressed over spikes, also yields a valuable oil. Oil of bergamot is expressed from the rind of *Citrus bergamium*, and oil of lemon from the fresh peel of lemons (*Citrus medica limonum*). All these oils are in considerable demand and command good prices, though lemon oil is in danger of being over produced in Sicily, and the high price of lime oil is quite abnormal and due to hurricanes in the West Indies having destroyed the plantations there.

As most varieties of citrus thrive in Rhodesia, it would seem as though there were a considerable opening for the production of these oils, but it must be remembered that it takes at least sixty trees in full bearing to produce a pound of neroli oil, one hundred gallons of lime juice to give four pounds of distilled lime oil, and fifteen hundred lemons to yield a pound of lemon oil. Consequently, most owners of citrus orchards are likely to prefer to stick to growing and selling fruit. In any case, as the method of growing trees for oil is the same as that for growing them for fruit, there is no need to say more here.

Eucalyptus Oil.—The ordinary eucalyptus oil of commerce is distilled from blue gum, which every Rhodesian farmer knows how to grow. Unfortunately the price of the oil is very low and there are ample supplies of it.

The present writer spent a great deal of time and energy establishing plantations of *Eucalyptus citriodora*—not an easy tree to handle in its early stages. The oil, however, is difficult to dispose of, and for some reason or other that distilled here seems to be inferior in quality to the Australian oil.

Miscellaneous Oils.—Spearmint, tansy, coriander and fennel were also experimented with here. The quality of the oils distilled was well reported on, except in the case of the last-named; but the demand for them is small, and there would be no object in growing them except in small quantities to fill up a larger consignment of more marketable oils.

Various local grasses and herbs have also been distilled, but nothing of commercial value has yet been discovered.

Distillation.—It remains to indicate briefly what is involved in the manufacture of the oils after the crop has been reaped.

The process of distillation is a simple one and does not require an elaborate plant. The latter consists of (1) a container or alembic, in which the material to be distilled is boiled with a certain quantity of water, (2) a swan-neck, which carries the resulting vapour from the alembic to (3) a condenser coil, round which cold water circulates, causing the vapour to condense to liquid.

The liquid consists partly of water and partly of oil; the latter floats on the top of the water and can easily be separated from it.

The boiling up of the material to be distilled can be either by means of an open fire under the alembic (a method which is now nearly obsolete, owing to the risk of damaging the oil by excessive heat) or by passing steam through the alembic, either direct or through a closed coil lying in the water; therefore (4) a steam generator is also a necessary part

of the plant. As, however, the steam is only required at a pressure of a few lbs., any simple form of boiler is adequate.

A certain amount of practice is necessary in regulating the temperature and knowing when to stop distilling. Sufficient mechanical skill to keep the various joints steam-tight is required, and reasonable care must be exercised in collecting and filtering the oil. But that is all. It is not the case, as stated in a South African technical journal, that "an ordinary native is quite capable of taking charge of the process," but at the same time it is not necessary to retain the services of a professional engineer.

It is difficult to give an accurate idea of the cost of the plant. It would, of course, be possible to distil with a home-made installation consisting of some forty-four-gallon petrol drums, with three-inch piping cooled in a running stream as a condenser. The first still used here cost £50 in Paris, and was quite adequate for experimental work. But for serious work on a commercial scale, handling the produce of, say, four hundred to five hundred acres, the installation would have to consist of at least eight to ten eight-hundred-gallon stills, and the cost could hardly be less than £1,500 to £2,000.

Conclusion.—From the above it will be seen that, to repeat what was said at the beginning of these notes, essential oil production is neither suitable for a stop-gap on a small farm nor for a side-show on a big estate. At the same time, there are various considerations which would make the manufacture of these oils, or some of them, an attractive proposition under certain circumstances in this country. The comparatively high value of the oils in proportion to their bulk is a great recommendation for those of us who have heavy freight charges to consider. Labour, wood fuel and water—all of them necessary factors in the production of these oils—are still cheap and plentiful in most parts of Rhodesia. And finally, there is a considerable fascination in attempting something out of the ordinary run of local crops—provided it can be made to pay.

Possibly the best way to produce essential oils profitably would be for a group of farmers to work in co-operation,

keeping down overhead charges by running a common distillery in which one of their number would specialise, and a common organisation for the marketing of their produce, whilst individual members of the group concentrated on various different crops so as to be as far as possible independent of market fluctuations which may be fatal to the success of any one single crop.

REPORT OF THE SENIOR ANIMAL HUSBANDRY OFFICER

FOR THE YEAR ENDED 31st DECEMBER, 1931.

By A. E. Romyn, Ph.D.

The cattle industry has been more or less at a standstill this year, owing to the outbreak of foot and mouth disease. The year gave promise of being a good one, and the outbreak of this disease was, therefore, particularly unfortunate.

1. Beef Production.—(a) *General.*—The effect of the restrictions on the export of cattle to adjoining territories has brought home to farmers the urgency for developing an overseas trade in chilled or frozen beef. Avenues of export have been explored in all directions, but so far nothing tangible has resulted. Investigations are proceeding.

Unfortunately, the great bulk of cattle available for export is only suitable for the frozen meat trade. This trade at present price levels is generally unremunerative, and the demand for frozen beef is decreasing. The number of cattle in the Colony suitable for the more remunerative chilled meat market is insufficient to produce workable quantities for export, and the prospect of low prices for most of the meat exported has so far discouraged export. Under the present

Department in future should be to discourage the establishment of new creameries unless there is some very obvious justification for their erection.

A considerable expansion of the cheese industry is looked for in the near future. Keen competition in this field is likely to arise from adjoining territories, and the Dairy Officer points out that it will be necessary for Rhodesian cheese-makers to improve the quality of the cheese manufactured locally to meet this competition successfully.

The contact between the dairy section and the trade has been closer this year than at any time hitherto, and there is good reason to feel that this closer co-operation will be of benefit to the industry in this Colony.

3. Sheep and Wool.—The year has been a successful one as regards breeding operations. The dry winter season proved favourable to sheep, and especially on the eastern border flocks are now in relatively good condition.

In the earlier part of the year prices for mutton sheep were well maintained, but towards the end of the year importations from the Union resulted in a fall in the price of local sheep. The low value for wool has discouraged the sale of that commodity, and many of the smaller producers have made no attempt so far to sell this season's clip.

On the ground of economy it was found necessary to dispense with the services of Mr. J. C. Kruger, who has done good work as part-time sheep and wool officer in the Melsetter district.

For some years to come it is likely that there will be a profitable market for mutton sheep in the Colony. The eastern border areas offer good possibilities for the development of Merino sheep; but the local farmer as a rule knows very little about sheep management, and it is unlikely that without proper guidance it will be possible for him to take advantage of the opportunities available. For this reason it is unfortunate that it was found necessary to dispense with a sheep officer, and it is hoped that a fresh appointment will be made as soon as conditions improve.

4. Pigs.—The year has not been a profitable one for producers. Varied restrictions on the export of pigs and pig

products from Southern Rhodesia, combined with the free import of bacon from the south into the Colony, have led to a surplus of pigs. The best grade of baconers have been sold on a "rationed" market at 3d. to 3½d. per lb. live weight. There has been no encouragement for production, and little progress has been made by the industry as a whole.

The future of the industry will lie eventually in the export of pig products overseas. This stage has not yet been reached. In the meanwhile, farmers must concentrate on the production of a better type of pig than is turned out at present. In this movement the curer must play his part by proper grading at the factory and the payment of a significantly better price for the best grade of pig. The immediate improvement will be to the benefit of both sides, as a well-bred pig is not only a more efficient producer than the "scrub," but it "cures" more satisfactorily and with less waste. Once producers are able to produce a good pig, the expansion of the industry to allow for export should be relatively rapid.

5. Poultry.—The Poultry Officer reports that on the whole the industry has "marked time" during the year.

The domestic competition between co-operators and non-co-operators in the Rhodesia Egg Circle has tended to depress prices, and it has been difficult to dispose of surplus eggs at payable prices. Complaints have been received as to the quality of eggs obtained from distant suppliers, and it appears that it will be necessary to institute a system of grading in order to give producers of truly fresh eggs the advantage they deserve. The poultry officers are endeavouring to bring about a better state of organisation in the industry. Such organisation appears essential for progress.

6. Investigations.—In a general way the problems confronting the live stock breeder in this Colony can be divided into two groups—(a) markets, (b) how to lower the cost of production of his basic products.

To a certain extent these are closely related.

Many problems await investigation, and it is unfortunate that in a pastoral country such as Southern Rhodesia so little serious investigation in the field of animal feeding and breeding has so far been undertaken. A start has been made

this year with cattle and pigs at the Matopos School of Agriculture, and with poultry at the Poultry Station, Salisbury. The chief investigations are:—

(1) A study of the effect of protein and mineral supplements on the growth of ranch cattle.

(2) A study of the effect of certain local feeds on the quality of bacon.

(3) A broad study of home-grown rations for poultry.

On the marketing side, two investigations which have been completed are;—

(1) An agricultural survey of the proposed Walvis Bay Railway route.

(2) The preservation and shipping qualities of chilled beef under local conditions.

A report on both of these subjects has been presented.

7. Extension Work.—On account of the lack of funds, farm visits and extension work in all branches of the Animal Husbandry section—cattle, dairying, sheep, pigs and poultry—have been much curtailed this year. In some cases it has not been possible to make full use of the services of officers of this section, and it is hoped that it will be possible to provide sufficient funds next year to enlarge essential organising and inspection services in regard to dairying, sheep, pigs and poultry, which have been reduced this year.

HANDBOOK OF TOBACCO DISEASES.

Attention of readers is drawn to the fact that the Department of Agriculture has found it most inconvenient, with the present shortage of staff, to handle the local sales of this book. Arrangements have therefore been made with the Rhodesian Printing and Publishing Company for distribution by them throughout Southern Rhodesia. The book may be obtained from the Herald Store, Salisbury, price 4s., or, postage paid, 4s. 4d.

SPEAR GRASS.

(*HETEROPOGON CONTORTUS*, R. & S.).

By J. M. Rattray, M.Sc., Botanist.

Introduction.—Now that the importance of improving the natural pastures of this country is being realised, it is obviously advisable to become better acquainted with some of the main species of grasses occurring in the pastures. The following article deals with one of the commonest grasses in Rhodesia, and is an attempt to show what importance economically should be attached to it.

Description.—*Heteropogon contortus*, R. & S., belongs to the same section of grasses as the Rhodesian blue grass (*Andropogon gayanus*) and the Tambookie grasses (*Hyparrhenia* spp.), viz., the *Andropogoneæ*. In the Union it is known as "spear grass," and in Rhodesia it is commonly called "assegai grass," though the name "spear grass" is also extensively used. In India it has the very appropriate common name of "twisted beard grass."

It is an erect tufted perennial with very compressed leaf sheaths and light green leaves up to 9in.-10in. long and about ¼in. wide. The flower head is a "spike" with the spikelets tightly compacted together and bearing long twisted awns. The "seed" is extremely sharp pointed at one end and bears the awn, which in the presence of moisture coils up and produces a boring movement. When the seed plus awn falls to the ground the first shower of rain causes the awn to coil up and in this way the seed is pushed into the soil. A small tuft of stiff hairs behind the point of the seed allows it to be pushed in, but prevents it from coming out again.

Thus it is that Spear grass can establish itself on hard soils, while the seeds from other grasses are blown or

washed away before they can germinate. Dew and sunshine cause the awn to twist and untwist and so drive the barb into whatever it is in contact with.

It is this property which the seed possesses of being able to bore its way in, that makes Spear grass the curse that it is on certain grass lands.

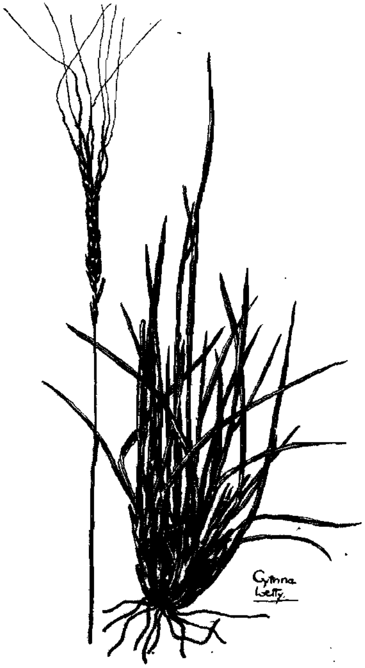


Fig. 1.
Heteropogon contortus, R. & S., Spear Grass.

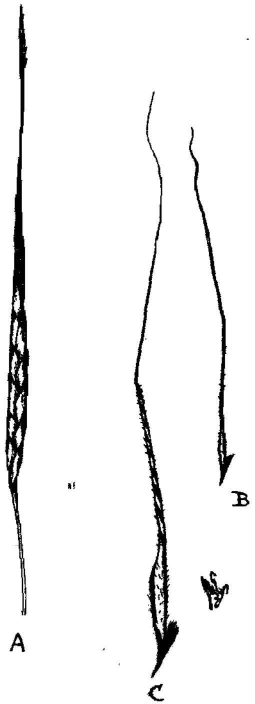


Fig. 2.

A. Flower Head of Spear Grass.

B. "Seed" of Spear Grass bearing the awn.

C. Enlarged View of B, showing sharp-pointed seed and twisted awn.

Distribution.—This species of grass is widespread over the tropical, sub-tropical and warm temperature regions of the world, including the Mediterranean region. In Rhodesia it has been collected in the Matobo, Bulawayo, Nyamandhlovu, Victoria Falls, Bubi, Salisbury, Hartley, Marandellas, Makoni, Inyanga and Umtali districts.

Economic Importance.—*Value.*—Hitchcock states that in America it "is an important forage grass," and in the Hawaiian Islands, where the natives use it for thatching, it is also a useful forage grass. In India if cultivated and cut before ripe it is considered one of the most nutritious grasses in that country. In the Union it is spoken of as yielding good grazing while young, but is a grass to be discouraged on account of the sharp-pointed seeds which injure stock.

In Rhodesia, Spear grass is generally looked upon as a weed of little or no value in pastures, except probably when very young.

Injurious Properties.—But if stock, especially sheep, are to be run on the poorer grass lands of this country with any measure of success, then one of the most important factors to be considered is the presence of Spear grass in the pasture. The species is very abundant on many of the poorer types of soil in the Colony and the "seed" which it so prolifically produces is most injurious to stock on account of the boring properties already described. When the hide of an animal is pierced and the seed has entered the flesh, inflammation usually sets in and sores are developed, which greatly detract from the value of the hide. But it is not only the hide of the animal which is in danger of being ruined; it is obvious that when an animal is badly invaded by the seeds, its condition will go down, and, in the case of sheep, wool production will be lessened, and what wool is obtained will be so matted with the awns as to be almost valueless. The seeds have even been known to cause the death of sheep.

Control Methods.—As Spear grass flushes very early in the season and is fairly palatable when young, it may be unwise to attempt to eradicate the whole plant, more so as

it often happens to be the dominant grass in a pasture. A more feasible plan is to prevent the grass, as far as possible, from seeding. Mowing the pastures before the seed has set would fulfil this condition, but this would only be practicable when the pastures are stumped and are of a fairly limited acreage.

A further difficulty which may be encountered in connection with mowing as a method of control was observed on land at Marandellas. When the flower heads of Spear grass first appeared they were quite erect and stood vertical to the ground, but as they grew older they leaned to one side to allow the new flower heads to come up from the centre of the crown. This went on for some time owing to the prolific way in which Spear grass flowered, so that when mowing commenced the old mature flowers were almost parallel to the ground and the general appearance of the plant, from the side, was fan shaped. The mower came over the plant, cut off the central erect younger flower heads, but left the mature ones round the outside of the crown, so that there was still an abundance of seed available to the plant for dissemination.

One might think that fairly heavy grazing would tend to keep down Spear grass, but it seems to he the general consensus of opinion that over-grazing causes it to increase. And in any case, too, heavy grazing should be avoided as far as possible, as it is likely to prove injurious to the other constituents of the pastures.

It has been said that Spear grass appears to be palatable when young. Unfortunately it seems either to lose this palatability as it grows older, or it is not as palatable as the surrounding grasses even at the time of flushing, because as soon as new growth is visible in the other grasses, stock leave the Spear grass severely alone in favour of other species. In this way it rapidly reaches maturity and produces its seed in great abundance.

Chemical Analysis.—An analysis of an air-dried sample of Spear grass, cut on the 4th March, 1932, when it was in full flower, showed it to have a low feeding value—the nutritive ratio being 1: 20.

The following are the results of the analysis:—

	%
Moisture	11.2
Ash	4.9
Crude Protein	3.9
Ether Extract	1.5
Fibre	36.0
Carbohydrates	42.5
	100.0

As this sample was cut late in the season, it is only to be expected that the protein content would be low and the fibre fairly high, so that the merits of the grass should not be judged on this analysis alone. It is hoped later to obtain other analyses of the grass cut at different periods of the season. Only when this is done can any conclusion be drawn as to its nutritive value.

Acknowledgment is made to the Division of Chemistry for the above analysis.

Conclusion.—The animal is the best judge of the palatability of any grass, and from observations made, it appears as though it is only in the very young stages that Spear grass is at all relished. Since it possesses such harmful properties when old, it must be considered an undesirable, even detrimental, constituent of a pasture.

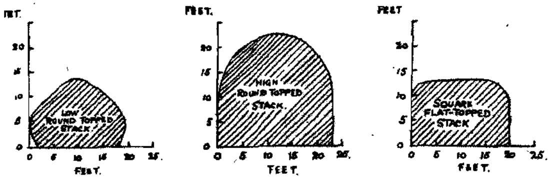
MEASURING STACKS OF HAY.

The United States Department of Agriculture, in conjunction with certain of the State experiment stations, recently had occasion to question whether the old formulas used in estimating the contents of hay stacks were accurate or otherwise.

On a careful study of the subject heing undertaken, it was found that calculations based on the previously used rules were generally inaccurate, and investigations were then undertaken with the purpose of developing a new rule or rules, which, while using the old measurements, would give more accurate returns.

The results of this investigation were published by W. H. Hosterman, of the Bureau of Agricultural Economics, in Leaflet No. 72 of the United States Department of Agriculture, from which the following extracts are taken:—

"The width and over measurements are made easily, and for this reason those who buy and sell hay by measure use rules that require only three measurements, namely, width, length and over. Width is the width of the stack at the ground; length is the average length of the stack; and over is the distance from the ground on one side over the stack to the ground on the other side.



Cross sections of typical oblong stacks.
(Leaflet 72, U.S. Dept. of Agric.).

"The volumes determined by these rules averaged the same as the actual volumes of the stacks, and in no case was the error over 5 per cent.

"The three types of stacks illustrated, with the rule for each type, are as follows:—

For low, round-topped stacks, (0.52 x O)−(0.44 x W) x WL
For high, round-topped stacks, (0.52 x O)−(0.46 x W) x WL
For square, flat-topped stacks, (0.56 x O)−(0.55 x W) x WL

"In these rules O equals the over, W equals the width *and L equals the length.*

"Example.

"To *determine the volume of a rectangular stack of the* high, round-topped type, that is 20 feet wide, 45 feet over and 50 feet long:—

Volume = (0.52 x 45)−(0.46 x 20) x (20 x 50)

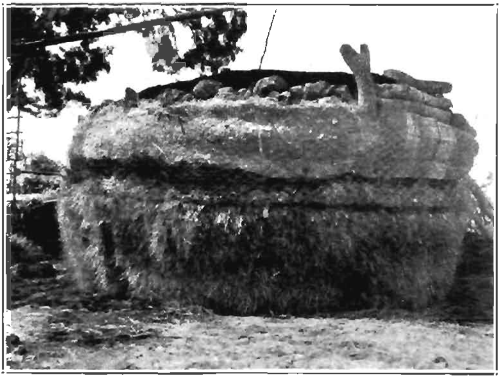
45	20	50
0.52	0.46	20
90	9.20	1,000
225		
23.40		
-9.20		
14.20		
1,000		

14,200.00 cubic feet in the stack.

"A simple rule or formula, similar to the ones given for oblong stacks, could not be developed for round stacks, but Table I. gives the volume of round stacks when the circumference is between 45 and 90 feet and the over between 25 and 37 feet.

"The volume of stacks having circumferences of overs greater or less than those given in Table I. can be calculated by using the formula: Volume=(0.04 x O)−(0.012 x C)C^2. In this formula C equals the circumference or distance around the stack at the ground and O equals the over or distance from the ground on one side over the peak to the ground on

1. Grass silage on the Salisbury Experiment Station: well pulled at base and with sheet suspended to give protection from prevailing wind.



2. The same stack as shown in illustration No. 1, but completed. The top surrounded with an edging of heavy wire netting and the stack weighted within this with stones and logs, the top covered with earth.

3. A grass silage stack weighted down with wires across the top to which bags filled with earth are suspended. The stack is on too large a base compared with its height and the weight applied is probably insufficient. Considerable waste is expected.

4. A completed grass silage stack at the Gwebi farm, built within a circle of gum poles. This system has not given as good results as were expected.

TABLE I.—Volume of Round Stacks of Hay of Specified Dimensions.

(Volume figures given to the nearest 5)

Circumference	Indicated volume in cubic feet when the over is— 25 feet	26 feet	27 feet	28 feet	29 feet	30 feet	31 feet	32 feet	33 feet	34 feet	35 feet
45	825	960	1,090	—	—	—	—	—	—	—	—
46	840	975	1,105	1,235	—	—	—	—	—	—	—
47	855	990	1,120	1,250	1,385	1,505	—	—	—	—	—
48	870	1,005	1,135	1,265	1,400	1,525	1,650	1,785	—	—	—
49	885	1,020	1,150	1,285	1,420	1,540	1,670	1,805	1,935	—	—
50	900	1,035	1,165	1,300	1,435	1,560	1,690	1,825	1,955	2,090	2,215
51	915	1,050	1,180	1,315	1,450	1,580	1,710	1,845	1,980	2,110	2,240
52	930	1,065	1,200	1,330	1,465	1,600	1,730	1,865	2,000	2,130	2,265
53	945	1,080	1,215	1,345	1,485	1,615	1,750	1,880	2,020	2,155	2,290
54	960	1,095	1,230	1,360	1,500	1,630	1,770	1,900	2,040	2,180	2,320
55	975	1,110	1,245	1,380	1,515	1,650	1,790	1,920	2,065	2,205	2,345
56	990	1,125	1,260	1,395	1,530	1,665	1,810	1,940	2,085	2,230	2,375
57	1,005	1,140	1,275	1,410	1,550	1,685	1,830	1,960	2,105	2,250	2,400
58	1,020	1,155	1,290	1,435	1,565	1,705	1,850	1,980	2,125	2,275	2,425
59	1,035	1,170	1,310	1,450	1,580	1,720	1,865	2,000	2,150	2,300	2,455
60	1,050	1,185	1,325	1,465	1,600	1,740	1,885	2,020	2,170	2,325	2,480
61	1,065	1,200	1,340	1,485	1,615	1,760	1,905	2,040	2,195	2,345	2,510
62	1,080	1,215	1,355	1,500	1,635	1,775	1,925	2,060	2,215	2,365	2,535
63	1,095	1,230	1,370	1,515	1,655	1,795	1,945	2,080	2,235	2,390	2,560
64	1,110	1,245	1,385	1,530	1,670	1,810	1,960	2,100	2,260	2,415	2,585
65	1,125	1,260	1,400	1,545	1,785	1,830	1,980	2,120	2,280	2,440	2,615
66	1,140	1,275	1,420	1,560	1,705	1,850	2,000	2,140	2,300	2,465	2,640
67	1,155	1,290	1,435	1,575	1,720	1,865	2,020	2,160	2,325	2,485	2,665
68	1,170	1,305	1,450	1,595	1,740	1,885	2,040	2,180	2,345	2,510	2,690
69	1,185	1,320	1,465	1,610	1,755	1,905	2,055	2,200	2,365	2,530	2,715
70	1,200	1,335	1,480	1,625	1,770	1,925	2,075	2,220	2,385	2,555	2,745
71	1,215	1,350	1,495	1,640	1,790	1,940	2,095	2,240	2,405	2,580	2,770
72	1,230	1,365	1,515	1,660	1,805	1,960	2,115	2,260	2,430	2,605	2,795
73	1,245	1,380	1,530	1,675	1,820	1,975	2,135	2,280	2,450	2,625	2,825
74	1,260	1,395	1,545	1,690	1,840	1,995	2,150	2,300	2,470	2,650	2,850
75	—	1,410	1,560	1,705	1,855	2,010	2,170	2,320	2,495	2,675	2,875
76	—	1,425	1,575	1,725	1,870	2,030	2,190	2,340	2,515	2,695	2,905
77	—	—	1,590	1,740	1,890	2,050	2,210	2,360	2,540	2,720	2,930
78	—	—	1,605	1,755	1,905	2,070	2,230	2,380	2,560	2,745	2,955
79	—	—	—	1,775	1,925	2,090	2,250	2,400	2,580	2,765	2,980
80	—	—	—	1,790	1,945	2,105	2,270	2,420	2,605	2,790	3,010
81	—	—	—	1,805	1,960	2,125	2,285	2,440	2,625	2,815	3,035
82	—	—	—	1,820	1,975	2,145	2,305	2,460	2,645	2,835	3,060
83	—	—	—	—	1,995	2,160	2,325	2,480	2,665	2,860	3,090
84	—	—	—	—	—	2,180	2,345	2,500	2,690	2,880	3,115
85	—	—	—	—	—	—	—	2,520	2,710	2,905	3,140
86	—	—	—	—	—	—	—	—	2,735	2,930	3,170
87	—	—	—	—	—	—	—	—	—	—	3,195
88	—	—	—	—	—	—	—	—	—	—	—
89	—	—	—	—	—	—	—	—	—	—	—
90	—	—	—	—	—	—	—	—	—	—	—

the other side. Usually it is advisable to take two over measurements at right angles to each other and to average them.

"Example.

"To determine the volume of a round stack that is 100 feet in circumference and has an average over of 60 feet:—

$$\text{Volume} = (0.04 \times 60) - (0.012 \times 100) \times (100)^2$$

60	100	100
0.04	0.012	100
2.40	200	10,000
−1.20	100	
1.20	1.200	
10,000		
12,000.00 cubic feet in the round stack.		

"Volumes given in the table or determined from the formula will, on the average, amount to the actual volume of the stacks, and in most individual cases the volume will not vary more than 10 per cent. from the actual volume.

"*Cubic Feet per Ton.*

"Many factors affect the density of hay in the stack, and *therefore the number of cubic feet required for a ton of* hay. The factor that causes the greatest variation is probably moisture in the hay at stacking time. Tough or slightly under-cured hay will settle and become more compact than very *dry or over-cured* hay. Other *factors* like *texture* and foreign material may affect the density also, but probably not to the same extent as moisture. For these reasons there is often a considerable difference in the number of cubic feet *required for a ton in different* stacks, *and*, at *present*, there are no simple methods for measuring variations in density.

"The following figures, which are the averages obtained from a large number of stacks, can be used with fairly good results:—

"**Wild hay:** 30 to 90 days in stack, 600 cubic feet per ton; over 90 days in stack, 450 cubic feet per ton."

FARMING CALENDAR.

May.

BEE-KEEPING.

Last month under normal conditions should have seen the last honey flow of the season almost ready for robbing, for which purpose have the extractor overhauled, spare crates available, bee escape boards ready, honey jars and bottles ready for usage, and also have a few spare quilts on hand. Do not rob the bees of too much honey, remembering that sending them into winter quarters with a sufficiency of food means a strong issuing colony in the spring. Any new swarms that it may be decided to add to the apiary, feed well if necessary, to induce stimulative breeding while there is time, or if new young queens have replaced older ones also feed liberally this month in the proportion of one part of cane sugar to two of water; for the somewhat wild Rhodesian bee there is nothing like the Alexander feeder let in from the back. Keep all the spaces under hive stands clean, also inspect daily to see that white ants are not building up from the soil; if this is neglected much loss may follow. When seen, sprinkle diluted kerol from a watering can under the hive stand.

Granulation in the bottled honey can be prevented by first ripening the extracted honey in large tins covered with butter muslin for three or four days by exposure to the sun's rays. It should then be heated to a temperature of 150-160 degrees—nothing higher. As soon as this is reached withdraw the tins and bottle when cooling. The best way to obtain this heating is to place the tins in another receptacle of cold water and boil it up to the required heat, as heating it direct over a fire is very liable to burn the contents or to impair the delicate flavour of the natural honey.

CITRUS FRUITS.

The harvesting of the early ripening fruit should be commenced about the first week in May. Exporters should cure their Washington Navels for a longer period than usual; this will enable them to detect the thick skinned fruit easily. Where necessary, irrigation should be continued up to within ten days of harvesting. All ploughing and cultivation should be completed without delay.

CROPS.

Continue to cut and stook maize as it matures; make the stooks small to assist drying. Later in the season the stooks may be made larger. See that the stooks are secure and pick up plants lying on the ground. Continue to plough up land between stooks of maize. Give all maize harvested, whether husked or in the husk, a chance to dry out before riding to the dumps. Do not begin shelling if the ears are still damp. Do not use new grain bags for harvesting maize. Make the dumps of unhusked ears as small as possible; the smaller the dump the quicker the grain will dry out. Grain on the cobs dries extremely slowly, if at all, in dumps of large size. Do not mix unhusked ears from the stooks with dryer ears harvested later from the standing crop. Keep the dryer ears in a separate dump; shell, bag and stack such maize separately. When cutting maize for stooking, insist on the stalks being cut within 2 to 4 inches of ground level. The plough, in Rhodesia, will not bury roots with stalks 8 to 12 inches high.

A long stubble of stalks makes clearing of the ground for ploughing very tedious and expensive. If not already harvested, ground nuts should be lifted before the first frosts damage the hay. Finish transplanting onions from seed-beds. If plants are not flourishing after transplanting, give a light dressing of nitrate of soda—50 lbs. per acre. Repeat in a fortnight if needed. Sow most winter cereals on wet vleis or under irrigation early this month. Feed your sweet potato vines to stock; if frosts occur the vines will be killed. Dig and feed tubers from end of month onwards. Towards end of month harvest cattle pumpkins and melons and handle carefully; avoid bruising to prevent rotting. Place pumpkins and melons in a dry situation in the open and in a single layer. Supply plenty of roughage to cattle pens, kraals and stables to increase the manure supply. Collect and cart manure to lands for spreading. Do not attempt to plough in dry grass or quantities of maize refuse. The plough will not turn it under and it will not rot before next planting season. Burn such refuse and make a good job of the ploughing. If the weather seems set fair, commence brick-making. A small kiln of bricks always on hand is most useful. As labour permits, re-thatch buildings and outhouses in need of repair. Overhaul, grease and paint planters, drills and other implements not required again until next season, and store away under cover. Think about your fertiliser requirements for next season and place your orders. From now onwards the second ploughing of new land broken up earlier in the season should be pushed on with as opportunity offers.

DECIDUOUS FRUITS.

The pruning of early ripening peaches should be performed this month. All holes should be completed and kept in readiness for June planting. Ploughing or digging and cultivation should be completed without delay.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse (aphis) and Bagrada bug during May. For the former wash the plants frequently with a strong stream of cold water from a spray pump, or spray with soap and tobacco wash. Transplants may be dipped in the latter. Plants attacked by Bagrada bug may be sprayed with resin wash when the young bugs are exposed in the early morning.

Citrus Trees.—Continue to collect and destroy all fruits infested with citrus codling. Fumigate or spray for scale insects if necessary.

Guava.—Fruit fly and citrus codling breed in these fruits during the autumn and winter. Collect fruit and destroy.

Tobacco.—Watch should be kept for the emergence of the adult wire-worm beetles. These should be poisoned with a bait consisting of maize bran moistened with a solution of 1 lb. arsenite of soda in 20 to 30 gallons of water. The bait should be rolled into small balls and scattered on the lands, one ball to each ten square yards. The bait should be covered with a few leaves and moistened as required. Chopped green stuff such as Napier fodder may also be used as a carrier for the poison, in which case molasses should be added at the rate of 1½ gallons to 10 gallons of the arsenite solution, or cheapest sugar at the rate of 10 lbs. per 10 gallons. The bait is best laid in the evening.

Fields of tobacco found to be heavily infested with gallworm should be thoroughly ploughed and cross-ploughed and laid down to an immune crop next season.

Cotton.—Continue trapping and destroying stainers. All dropped bolls should be collected and destroyed.

Maize.—Clean up storage sites, sidings and sheds against weevil.

Potatoes.—Late potatoes should be kept earthed up to prevent tuber moth from attacking the tubers.

FLOWER GARDEN.

The month of May is a suitable one for the preparation of new flower beds. The ground should be well trenched, and if of poor quality, a light dressing of well rotted manure will be a distinct advantage. Too heavy dressing is not advised, as too rich a soil is likely to produce an abundance of foliage and very few flowers. It is not too late to sow sweet pea seeds, but the best results come from early planting. By this time all bulbs for spring flowering will be planted. Chrysanthemums, delphiniums, dahlias and other herbaceous perennials may now be cut down, and if necessary taken up, divided and replanted

VEGETABLE GARDEN.

It will be necessary during the early part of the month to clear off what remains of summer crops, such as haricot beans, peas, cucumbers, etc. Where winter deep rooting vegetables are to be grown, such as carrots, parsnips and beets, the soil and sub-soil should be deeply worked, so as to allow a ready root run for these vegetables. A dressing of lime will be of great value in every section of the kitchen garden. This will especially help to minimise future attacks of insects and fungus attacks. New asparagus beds may be made this month; old beds should be cut down, cleaned and kept in good order; also a light dressing of stable manure may be given to the beds. Planting may be made of all seedlings, such as cabbage, cauliflower, lettuce, onions, etc., and seeds of carrot, leek, lettuce, onions, peas, radish, turnip, parsnip, broad beans may be sown.

FORESTRY.

Continue pricking out coniferous seedlings into tins or beds. Deciduous trees which are propagated by means of cuttings should be taken in hand. See that the fire lines are in order, and in the case of woods which have formed canopy, remove inflammable material below the edge trees.

POULTRY.

All cockerel chickens should be separated from the pullets, and every month gone over carefully, the poorer ones eliminated and only the very best kept. Those cockerels with the deep long bodies, short legs and round heads should be kept. Those with any inclination to long legs, knock knees, long heads or thin beak, lop-over combs, narrow bodies, or those lacking length and depth should be rigorously discarded. The chickens must not be allowed to become chilled, especially at night; on the other hand, they must not sleep in a hot stuffy atmosphere. On no account must they be overcrowded; this is fatal and is one of the many rocks on which poultry keepers come to grief.

The young stock must have all they can eat; to stint them is to ruin them for good and all. A bird that has been stunted never recovers. A good quality bone meal (lime phosphate) is absolutely necessary, as is also plenty of succulent green food, and no animal protein is better than thick separated milk for the health and growth of the chickens.

Those going in for ducks should hatch according to the numbers they have to supply for eating each week. Ducks must have all the food they will eat from the time they are hatched. A quick-growing duck should put on 1 lb. per week and be ready for killing at from seven to eight weeks old. Always kill or sell for killing just before the large wing feathers commence to grow.

If the rains have stopped, turkeys can be hatched. See that the youngsters are kept warm, but also that they have plenty of fresh air. Never feed young turkeys on wet or moist food, but give dry mash, grain, plenty of onion tops or onions chopped small, and thick separated milk. Keep them free from insect vermin; they will never thrive if they are infested with these.

Never allow the hen that has hatched the turkey eggs to run with the youngsters. Always confine her in a coop, through the slats of which the young turkeys can run in and out. The coop should be moved to fresh ground each day; nothing is worse for young turkeys than to be running on the same piece of ground for long at a time. Tainted ground is one of the chief causes of mortality among young turkeys.

STOCK.

Cattle.—By the middle of this month dairy cattle will require more serious attention in the matter of feed. Grass should be cut for bedding, and both cows and calves should be well bedded down at night from now onwards, and cowsheds should be put in good repair. Attention should be given to the water supplies, and care taken that they are clean and sufficient.

Boggy sources of water supply are a frequent source of loss of cattle during the winter months. With adequate water supplies cattle can withstand considerable shortage of grazing. Weaners should be fed a good roughage ration—with or without a small allowance of grain, depending on circumstances—to keep them growing through the winter months.

Get in the bullocks for winter fattening.

Sheep.—The ewes should be lambing now. It is the general experience in the Colony that winter lambs are better than spring ones. Adequate feed must be provided to keep up the milk flow of the ewes. For this purpose a stand of winter oats or barley, on which the ewes can graze for an hour a day, is excellent. A little maize with a legume hay will also give very good results. Where roots do well, they will make a valuable succulent feed for sheep. The sheep should have access to some shelter from the cold winds. Dock the lambs.

TOBACCO.

Curing should be completed as early in the month as possible to prevent loss from frost. The bales of tobacco should be examined and turned weekly until they are despatched from the farm. All bulks must be inspected regularly and turned if necessary. Tobacco seed should be shelled as soon as the seed pods are dry and the seed carefully labelled and stored in a dry place. The stumping, clearing and ploughing of new land, if operations have not already been commenced, should be no longer delayed. Land which has just produced a crop should be ploughed and harrowed as soon after the harvest as possible.

VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

WEATHER.

During the major portion of this month the ordinary winter conditions prevail, viz., cloudless sunny days and cold nights. Frost may be normally expected at any time during the latter half of the month. There is often, however, a recrudescence of rain conditions during the early portion of the month, resulting in overcast days and light drizzling showers, the normal rainfall at many places, particularly in the southern and eastern portions of the country, amounting to over half an inch.

June.

BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

CITRUS FRUITS.

Cultivation of the grove is to be continued. Early ripening fruit must be harvested and marketed without delay. Mid-season varieties will be fit for packing early in the month. These should be shipped as early as possible, so as to extend the late variety export season as much as possible. Most late ripening varieties will require irrigating during the month.

A small amount of pruning should be done. If fumigation is to take place, remove the small branches that touch the ground, cut out all dead wood and water shoots.

CROPS.

Select seed from the very best of your own crops. It is always wise to keep more seed than you may need for planting. Do not shell and ride your maize to the railway unless it is fit for export or market. If in doubt regarding the moisture content of the maize, send a 2 lb. sample in an air-tight tin, such as a golden syrup tin, to the Agricultural Department and have it tested. Provide ample dunnage for your maize stacked at the railway or on the farm. Use maize cobs; husks are almost useless for this purpose. Sew your bags of maize according to the export regulations and stack them properly at the railway side, leaving plenty of room between the double rows. Select pumpkin and melon seed from the best specimens. Support your agricultural show and make it a success by preparing and entering as many exhibits as you can. No one is more to blame for a poor show than the farmers themselves. Make a list of the seed requirements for next season, and where purchases must be made, place the orders early.

In cleaning up the cotton fields care will have to be exercised in the supervision of the pickers. The cotton harvested at this period of the season generally comes from late bolls naturally matured and those prematurely opened by the cold weather and frost. The matured seed cotton should be kept entirely separate from the immature seed cotton. There will also be some dirty and stained cotton in this final picking. Arrangements for next season's seed requirements should receive consideration.

Veld fires must be anticipated, and if not already attended to, the mowing or burning of fire-guards, both boundary and internal, should be proceeded with.

DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. During cold

weather it is frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

Under the cool conditions which obtain from this time of the year onwards, cheese-making operations are usually most successful.

Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard, dry cheese will result. Morning's milk plus a starter usually gives the best quality of cheese. The starter should have a clean sour taste and smell. In early winter, milk for cheese-making frequently contains a high percentage of fat, and in order to firm the curd properly in the whey it is usually necessary to raise the scalding temperature a few degrees.

At this period of the year winter feeding of dairy stock should commence in real earnest. The milking cows should now be in fairly good condition, and in order to maintain a full flow of milk throughout the cold, dry months of winter, it is essential that liberal feeding be practised. As far as possible an attempt should be made to imitate summer conditions by feeding an abundance of succulent and palatable food. Maize silage, sweet potatoes, pumpkins, etc., are very useful for this purpose, but these feeds should be supplemented by dry roughage of good quality, preferably a legume hay, and a liberal allowance of mixed concentrates.

For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

DECIDUOUS FRUITS.

General pruning may be done this month if the leaves have fallen. This should be confined, as far as possible, to the thinning out of diseased, weak, broken and dead shoots. Tall trees may be reduced in height, and old and unprofitable trees headed back to induce the growth of new fruiting wood. Trees that shed their leaves late may be pruned in July. The necessary preparations for planting trees should be completed during the month and planting commenced towards the end of the month. Cultivation should be continued.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in paraffin tins cut lengthwise, in a place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less

watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

FORESTRY.

Care should be taken by further ploughing of land or burning of grass that all fireguards round plantations are in good order and effective. Thinnings where necessary may be continued, and fellings which are to be made are to be carried out. Cuttings may be taken and struck now of deciduous trees, such as the Carolina poplar. The pricking out of conifer seedlings into tins should be continued, and sowing of such seed for the coming planting season may be completed. A commencement may be made of preparation of land to be planted during the ensuing season, e.g., by stumping if necessary, and ploughing where practicable.

GENERAL.

Grazing is deteriorating, and the next few months may be a period of difficulty for the rancher. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

POULTRY.

The poultry keeper must be on the look-out for sudden cold snaps, for if some precautions are not taken, the production of eggs will drop.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left, you will have infertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. See that the male bird has all the food he requires, and give him a meal by himself twice a week, also a small piece of raw meat three times a week. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

STOCK.

Cattle.—Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Where winter calves are required, the bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground nuts, ground nut cake or bean meal. Young calves are better in the pen on very cold mornings until the sun has gained some power, when they may run on short, sweet veld for a few hours.

Sheep.—Continue to feed the ewes and lambs well. Older sheep should generally also be given some supplementary feed now. Sheep should not be allowed to get into low condition, especially in areas where parasite infection is to be feared.

TOBACCO.

The grading of tobacco should be proceeded with. Any bales stored on the farm should be turned occasionally, especially where more

than one bale is placed on another. Arrangements for the grading of tobacco seed should be made for the coming season. Growers purchasing tobacco seed should place orders early with distributors of reliable seed.

VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

GWEBI PRODUCE PRICES.

Hull-less oats	40/- per bag of 150 lbs.
Large Black sunflower seed ...	14/- per bag of 100 lbs.
Dolichos beans	35/- per bag of 200 lbs.
Linseed	60/- per bag of 200 lbs.
Linseed (quantities under 100 lbs.)	4½d. per lb.
Sweet potato tubers (Calabash Leaf)	6/- per bag of 150 lbs.
Napier fodder roots	6/- per bag of 40 lbs.
Sweet potato cuttings (Calabash Leaf)	6/- per bag of 40 lbs.
Edible canna corms	10/- per bag of 150 lbs.
Pumpkin seed	1/1 per lb.

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

SOUTHERN RHODESIA VETERINARY REPORT.

January, 1932.

AFRICAN COAST FEVER.

The slaughter of the infected herds on Hillside Farm, Melsetter district, was completed. No further infection occurred.

FOOT AND MOUTH DISEASE.

Victoria Veterinary District.—Two farms became infected in the Chilimanzi district and one in the Victoria district and a spread of infection occurred in the Nyadjena Native Reserve and Crown land adjoining. The mixing of healthy and infected herds has been carried out to hasten the spread of infection.

Gwelo Veterinary District.—A fresh outbreak occurred on a farm in the Charter district which spread to the adjoining farm. This district has been free from the disease for several months and the origin has not been traced. The progress of the disease in the Chilimanzi Native Reserve has been very slow and infection has now spread to three farms adjoining. The conditions in the other areas are satisfactory and infection is clearing up.

Bulawayo Veterinary District.—In the Ntabazinduna Reserve and the Shangani Ranch, Bubi district, the disease has been active and spreading throughout.

In the Belingwe district the disease is clearing except in the Belingwe Native Reserve, where inoculation is being carried out. The inoculated cattle in the Gwanda area were returned to the kraals and no further signs of the disease were found on Liebig's Ranch. This and the Tuli area are now considered clean.

Salisbury Veterinary District.—All the cattle in the northern section of the Chiweshe Reserve, Mazoe, were inoculated and the reactions were satisfactory. On one of the previously infected farms in the Salisbury district a calf was found to be infected and on inspection it was discovered that lesions existed in several of the calves born previously. These were the only two active areas during the month.

MYIASIS: SCREW WORM IN CATTLE.

This is prevalent in most districts.

TRYPANOSOMIASIS.

This disease has been spreading somewhat on the eastern border, Melsetter district; eight new cases have been reported.

SEPTIC PNEUMONIA IN CALVES.

Many cases were reported in the Gwelo district and on one farm eleven deaths resulted.

PIROPLASMOSIS.

A serious outbreak of this disease occurred on a farm in the Salisbury district amongst cattle recently removed and not regularly dipped. Seven head died and many were seriously affected.

OPHTHALMIA.

Cases have been reported from many areas.

IMPORTATIONS.

From the Union of South Africa: Horses 2, sheep 1,666, goats 265.

EXPORTATIONS.

Nil.

February, 1932.

AFRICAN COAST FEVER.

An extension of the disease occurred on the farm Springvale, Melsetter district. This farm adjoins the previously infected areas Hillside and Tilbury Estate.

Prior to the diagnosis of the disease at Tilbury in May, 1931, a span of oxen travelled from that estate to Melsetter and spent the night in a camp on the town lands. As it was suspected that some of these animals might have carried the disease, a few cattle were placed in this camp in June and kept undipped for testing the existence of infection. One animal showed a rise of temperature on the 25th February and smears and *post-mortem* examination proved the existence of Coast Fever.

The fact of these oxen having carried infection to the Melsetter town lands shows that in all probability the farms *en route* will also be infected.

FOOT AND MOUTH DISEASE.

Gwelo Veterinary District.—The disease appeared on a farm adjoining the Central Estates, Chilimanzi district, where the cattle were dipped, and infection spread to three camps on the estate. The disease is practically cleared up on the two farms in the Charter district and has cleared up in six farms in Selukwe district and in the Lundi Reserve, Belingwe district.

Victoria Veterinary District.—An outbreak occurred in the Mtilikwe Native Reserve, Victoria district, and the spread of the disease is being hastened by contact, which has been satisfactory at the Nyadjena Native Reserve.

The position in this veterinary district is satisfactory. Active infection exists only in the southern portion of the Victoria district.

Bulawayo Veterinary District: *Bubi District.*—The disease is now cleared up in the Battlefields Block and Ntabazinduna Reserve and on the latter was kept within the cordon line. In the Shangani Ranch it is still running its course.

Belingwe District.—A farm on the north of the Belingwe Reserve became infected and the cattle there and adjoining will be inoculated. The inoculation of all the herds within the cordon on the Belingwe Reserve has been completed.

Salisbury Veterinary District.—A few cases have occurred within the inoculated area on Chiweshe Reserve, Mazoe district, amongst a herd that did not react to the virus, but passed through with natural infection.

MYIASIS: SCREW WORM IN CATTLE.

The screw worm is very prevalent, especially amongst cattle infected with foot and mouth disease, where it aggravates matters.

HORSE-SICKNESS.

Deaths have been reported from the following districts: Charter 3, Gwelo 2, Mazoe 3, Umzingwane 1.

TRYPANOSOMIASIS.

A few cases occurred in Wankie district, and on several farms in the Gatooma area. Two deaths in the Melsetter district.

SWEATING SICKNESS.

There has been an unusual number of calves reported suffering from this ailment.

IMPORTATIONS.

From the Union of South Africa: Bulls 6, heifers 35, horses 5, sheep 2,233, goats 125.

EXPORTATIONS.

Nil.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

SOUTHERN RHODESIA WEATHER BUREAU.

MARCH, 1932.

Pressure.—The mean barometric pressure was generally above normal, except in the north.

The equatorial low was very active during the early part of the month; it extended into Southern Rhodesia on the 1st and 2nd and withdrew on the 3rd, extending to the

south from the 4th to the 7th, and was over Southern Rhodesia on the 8th and 9th. The withdrawal commenced on the 10th. On the 13th it again extended to the south-west coast, but broke up on the 15th, leaving a detached low on the south-east coast. Pressure then commenced falling in the north-east and remained very low over Madagascar to the end of the month. No lows of any importance appeared on the south coast.

A high appeared on the west coast on the 1st, and it moved round and reinforced the pressure on the east coast on the 3rd. A second high appeared on the south coast on the 10th and remained on the south-east coast until the 13th. The third was a rapid moving high; it was off the west coast on the 15th and the east coast on the 16th, and moved into the Limpopo Valley on the 18th. The fourth and fifth appeared on the south coast on the 19th and 21st, and established the semi-permanent high which covered South Africa with minor fluctuations to the end of the month.

Temperature.—The mean temperature for the month was generally below normal; the minimum temperatures were normal or slightly above, but the maximum temperatures were low.

Rain Periods.—Rain was fairly continuous from the 1st to the 16th; from the 1st to the 8th it was fairly general, but slackened off on the 9th; it was again fairly general from the 10th to the 16th; scattered showers were recorded on the 17th and 18th, and the weather was mainly fine for the rest of the month.

Rainfall.—The rainfall for the month was 7 inches, or 3 inches above normal, distributed as follows:—

	March, 1932.	Normal March.
Zone A	7.3	3.3
Zone B	5.3	2.9
Zone C	5.6	4.6
Zone D	7.8	5.0
Zone E	9.2	4.9
Zone F	12.1	9.0

The seasonal total is 26.8 inches approximately, or 0.3 inch below normal.

MARCH, 1932.

Station.	Pressure Millibars, 8.30 a.m. Mean.	Pressure Millibars, 8.30 a.m. Normal.	Temperature in Stevenson Screen ° F. Absolute. Max.	Absolute. Min.	Mean. Max.	Mean. Min.	Mean. ½ Max. Min.	Mean. Normal.	Mean. Dry Bulb.	Mean. Wet Bulb.	Rel. Hum. %	Dew Point F.	Cloud Amt. 0-10	Precipitation. Ins.	Precipitation. Normal.	Precipitation. No. of Days.	Altitude (Feet).
Bulawayo ...	868.6	868.2	83	48	75.8	59.1	67.5	69.0	65.3	61.7	82	60	6.7	5.88	3.3	13	4,436
Gwelo	862.3	...	81	48	76.9	58.3	67.1	69 6	65.0	61.8	83	60	5.0	10.07	3.3	13	4,632
Riverbank ...	...	...	58	49	79 8	60.9	70.4	71.7	68 6	64.1	78	62	...	7.45	4.1	15	4,100
Essexvale ...	...	...	93	51	81.5	61.1	71.3	71.1	66.0	62.7	83	60	...	11.16	3.8	13	3,828
Gwanda ...	906.6	...	90	53	79.0	61.3	70.2	...	69.8	64.0	73	61	4.6	5.49	2.0	11	3,235
Mazunga ...	948.1	947.7	91	55	81.1	63.2	73.7	76.4	73.2	67.4	74	65	5.7	0.96	2.2	7	1,970
Nuanetsi ...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	2.6	...	1,630
Between Rivers	...	...	86	60	81.8	58.8	70.3	...	67.3	64.3	85	63	5.1	4.28	6.2	16	3,970
Enkeldoorn ...	...	...	81	47	76.3	57.5	66.9	68.7	65.3	61.8	82	60	6.7	8.17	3.8	16	4,720
Gatooma ...	...	...	85	50	81.0	59.2	70.1	72.7	69.1	64.7	79	63	4.9	7.31	4.2	12	3,850
Miami	...	...	81	55	78.4	61 2	69 8	...	67.3	64.0	84	62	6.3	2.12	5.5	11	4,090
Salisbury ...	854.9	855.1	82	50	78.8	57.9	68.1	68.6	66.5	61.6	76	58	6.6	3.10	6.0	13	4,865
Sinoia, Citrus ...	...	...	84	53	80.0	60.0	70.0	...	67.6	63.6	80	62	...	3.86	4.0	10	3,830
Sipolilo... ...	...	...	84	53	77 9	60.8	69.4	...	68.8	64.3	78	62	5.2	3.67	4.1	11	3,900
Juliasdale ...	...	...	75	45	69.6	53.3	61.5	62.4	64 5	60.4	79	58	...	10.03	9.1	18	6,070
Mtoko	...	...	80	51	77.7	60.0	68.9	...	67.0	63.7	84	62	7.2	10.41	3.5	14	4,210
Shamva ...	...	...	86	53	81 6	64.0	72.3	...	71.0	67.8	85	66	6.8	4.94	4.8	18	3,170
Angus Ranch ...	...	...	88	57	80.9	66.2	73.6	75.1	71.2	67.5	83	66	...	5.24	5.0	13	2,300
Craigendoran ...	...	...	87	52	82 4	61 0	71.7	...	71.2	66.8	79	64	...	12.78	6.2	17	3,430
New Year's Gift	...	...	85	55	79.3	62.2	70 8	...	69.2	65.5	82	63	...	7.15	4.3	17	2,700
Nyamasanga ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5,080
Riverdene North	...	...	89	46	79.7	58.5	69.1	...	66.7	63.5	84	61	...	8.78	5.3	14	3,700
Stapleford ...	...	...	76	40	70.0	54.4	62.2	...	62.3	59.8	87	58	6.6	18.90	12 1	18	5,450
Umtali	892.7	892.1	85	52	77.8	61 0	69.4	70 6	68.7	64 8	81	63	7.1	11.75	5.3	17	3,677
Victoria ...	895.7	895.1	85	50	77.7	59.8	68.8	69.0	68.1	63.8	79	62	4.9	7.69	3.7	12	3,570
Melsetter ...	850.5	...	78	48	72.3	55.8	64.1	...	63.9	60.6	83	58	6.2	14.36	7.7	19	5,060
Mount Selinda	...	...	82	53	73.8	60.5	67.2	...	65.3	63.4	90	62	6.3	15.09	11.7	17	3,520

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